Foreign Pharmacopœias.—Official in Belg., Port. and Span.

French Oil of Rue is stated by Schimmel to differ from the Algerian Oil in its congealing point, both contain about 90 p.c. of ketones, but the French Oil contains almost exclusively Methyl-nonyl-ketone, m.p. 15° C. (59° F.), the Algerian, Methyl-heptyl-ketone m.p. −16° C. (3·2° F.).

Power and Lees in the examination of an essential Oil of Rue, apparently of Algerian origin, found the following constituents:—Methyl-*n*-heptyl ketone, Methyl-*n*-nonyl ketone, Methyl-*n*-heptylcarbinol, Methyl-*n*-nonylcarbinol, a blue Oil of high and inconstant boiling point, Acetic Acid in combination with Alcohols, a basic substance having an odour of Quinoline, a mixture of free fatty acids, Methyl Salicylate, an ester of Valeric Acid, apparently Ethyl Valerianate, Pinene, Lævolimonene and Cineol. The two ketones represented about 80 p.c. of the Oil, and were present in about equal amounts. The two alcohols represented about 10 p.c., and were present partly in the uncombined state and partly as Acetic esters, the Methyl-*n*-heptylcarbinol preponderating. The two Terpenes, together with Cineol, represented about 1 p.c. of the Oil. There was very little Pinene, and the amounts of Limonene and Cineol were about equal. The amount of blue Oil was about ½ p.c., and finally there was separated from the non-ketonic portion of the Oil a small amount of undistillable viscous substance, which was probably a decomposition product.—*Report of the Wellcome Chemical Research Laboratories.*

Tests.—Oil of Rue has a sp. gr. of 0·833 to 0·840, it is dextrogyrate possessing an optical rotation in a 100 mm. tube of +2°, the solidifying point is 8° to 10° C. (46·4° to 50° F.). It dissolves to form a clear solution in an equal volume of Alcohol (90 p.c.) or in 2 to 3 parts of Alcohol (70 p.c.). It was official in the *B.P.* '85.

CONFECTIO RUTÆ.—Fresh Rue, bruised, 1½ oz.; Caraway Seeds, 1½ oz.; Bay Berries, 1½ oz.; Prepared Sagapenum, ½ oz.; Black Pepper, 2 drm.; Honey, 16 oz.; Distilled Water, as much as may be necessary.—*P.L.* 1851.

This has been incorporated in the *B.P.C.*

ENEMA RUTÆ.—Confection of Rue, 3 drm.; Infusion of Chamomile, to make 20 fl. oz.—*St. George's.*

Confection of Rue, 1; Decoction of Barley, *q.s.* to produce 100.—*B.P.C.*

Oil of Rue, 20 minims; Starch Enema, 6 oz.—*Westminster.*

Not Official.

SABINÆ CACUMINA.

SAVIN TOPS.

FR., SABINE; GER., SADEBAUMSPITZEN; ITAL., SABINA; SPAN., SABINA.

The fresh and dried Tops of *Juniperus Sabina*, collected in spring from plants cultivated in Britain. The Savin Tops imported from France are not always those of *J. Sabina*.

It was official in *B.P.* '85.

Medicinal Properties.—A powerful local and general irritant. The ointment is used for maintaining discharges from granulating or blistered surfaces. It is a powerful emmenagogue, but its use requires caution, as it may cause inflammation of the abdominal and pelvic viscera.

Dose.—4 to 10 grains = 0·26 to 0·65 gramme.

Antidotes.—Stomach-tube, emetics; Castor Oil, Linseed poultices to the abdomen, opiates and demulcents.

Foreign Pharmacopœias.—Official in all except Ger., Jap., Span. and Swed.

Descriptive Notes.—Savin Tops are usually supplied in this country in the fresh state from the cultivated shrub, of which there exist two or three varieties; less frequently in the dried state, in the form of woody twigs or branchlets, 6 to 9 inches (15 to 22·5 cm.) long or more; or imported from Italy and the south of France in the form of broken twigs freed from the woody portion. In the Savin cultivated in England the leaves are generally spreading, but in the exotic Savin they are closely imbricated so as to form nearly cylindrical branchlets. The leaves are narrowly triangular and concavo-convex, about $\frac{1}{8}$ to $\frac{1}{6}$ inch (3 to 4 mm.) long and $\frac{1}{16}$ inch (1·5 mm.) in diameter, an oval oil gland being situated in the middle of the convex back of the leaf. It has a characteristic taste, and a distinctive odour when bruised, by which it can be recognised from other nearly allied species of Juniperus. French Savin is sometimes derived from *Juniperus phœnicea*, L., and *Juniperus thurifera*, L., var. *Gallica*.—*Coincy*, *P.J.* (4) xxi. 829–831.

Preparations.

TINCTURA SABINÆ.—1 of Savin Tops, dried and coarsely powdered, percolated with Alcohol (60 p.c.), to yield 8.

Dose.—20 to 60 minims = 1·2 to 3·6 c.c.

B.P. 1885, omitted in *B.P.* 1898, and now incorporated in the *B.P.C.*

U.S. has Fluidextractum Sabinæ, 1 in 1, with Alcohol (95 p.c.).

UNGUENTUM SABINÆ.—Fresh Savin Tops, bruised, 8; Yellow Beeswax, 3; Benzoated Lard, 16; melt the Lard and the Beeswax together on a water-bath, add the Savin, digest 20 minutes, strain, and press through calico.

B.P. 1885, omitted in *B.P.* 1898, and now incorporated in the *B.P.C.*

OLEUM SABINÆ.—A colourless, or pale yellow, oily liquid, possessing a peculiar, unpleasant, narcotic odour, and bitter, pungent, camphoraceous taste. It should be preserved in dark, amber-tinted, well-closed bottles. It is liable to become darker in colour and to thicken on exposure to air. It is a volatile Oil distilled in Britain from fresh Savin.

The principal constituent of the Oil is an Alcohol Sabinol, which appears in the Oil chiefly in the form of Sabinol Acetate, corresponding to a content of about 40 to 44 p.c. It also contains Cadinene, Pinene and Camphene, and an aldehyde or ketone possessing when re-formed from its Sodium Acid Sulphite compound an odour faintly resembling Cuminic Aldehyde.

Solubility.—4 in 1 of Alcohol (90 p.c.), in all proportions of Absolute Alcohol.

Dose.—1 to 4 minims = 0·06 to 0·24 c.c.; in pill with Soap and Liquorice Powder, *see* p. 897.

Foreign Pharmacopœias.—Official in Belg., Jap., Port. and U.S.

Tests.—Savin Oil has a sp. gr. of 0·910 to 0·930. An optical rotation of +40° to +60°, a Saponification value of 115 to 125. It dissolves to form a clear solution in about half its volume or more of Alcohol (90 p.c.), but does not form a perfectly clear solution in from 15 to 20 volumes of Alcohol (80 p.c.).

SACCHARINUM. *See* GLUSIDUM.

SACCHARUM LACTIS.

MILK SUGAR.

B.P.Syn.—LACTOSE.

$C_{12}H_{22}O_{11}, H_2O$, eq. 357·48.

FR., LACTOSE; GER., MILCHZUCKER; ITAL., LATTOSIO; SPAN., LACTOSA.

White, or almost white, prismatic crystals, or masses of crystals, or as a white, odourless powder, possessing a slightly sweet taste. It is obtained by recrystallisation from the evaporated Whey of cow's Milk.

Solubility.—1 in 6 of cold Water; 1 in 1 of boiling Water; almost insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Nutrient in various cases of extreme irritability of the stomach, as it does not ferment so readily as Cane Sugar; it is used to mix with the food of children. Added to diluted cow's Milk a good substitute for human Milk is formed. Slightly diuretic in cardiac dropsy. Useful for triturating with potent medicinal powders, in order to equally distribute the dose.

Dose.—60 to 120 grains = 4 to 8 grammes, or more in Water.

Official Preparations.—Used in the preparation of Extractum Belladonnæ Alcoholicum, Extractum Nucis Vomicæ, Extractum Physostigmatis, Extractum Strophanthi and Pulvis Elaterini Compositus.

Foreign Pharmacopœias.—Official in all. Fr. (Lactose), Ital. (Lattosio), Mex. (Azucar de Leche), Port. (Assucar de Leite), Span. (Lactosa).

Tests.—Milk Sugar dissolves in Water forming a clear solution, which is neutral in reaction towards Litmus paper and which is dextrogyrate. A small quantity of the aqueous solution added to Potassio-cupric Tartrate (Fehling's) Solution, produces an immediate red precipitate of Cuprous Oxide, when boiled with an equal volume of Sodium Hydroxide Solution the liquid turns yellowish-brown and finally a brownish-red. Milk Sugar may be readily determined by titration with Pavy's Copper Solution. When present together with Cane Sugar the latter may be also determined by inverting with Citric Acid and making a separate determination of the reducing power of the inverted solution by Pavy's Solution. The difference between the reducing power of the solution before and after inversion corresponds to the amount of Cane Sugar present. 49·4 parts of Cane Sugar have the same reducing power as 100 parts of Milk Sugar. Citric Acid does not invert Milk Sugar but readily inverts Cane Sugar. Milk Sugar when boiled with Sulphuric Acid undergoes hydrolysis, with the formation of Dextrose and Galactose.

The more generally occurring impurities are heavy metals, *e.g.*, Arsenic, Copper, Lead, Iron and Zinc, Cane Sugar, Dextrin, Starch, free Lactic Acid, and mineral matter. Arsenic, Copper, Lead, Iron and Zinc, if present, may be detected by the Hydrogen Sulphide test, either in a solution rendered faintly acid with diluted Hydrochloric Acid or in one made alkaline with Ammonia Solution. Cane Sugar and Dextrin, if present, may be detected by the Alcohol test and Starch by the Iodine test. If free Lactic Acid be present, the quantity may be determined by titrating a weighed quantity of the substance with Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. The *B.P.* requires that a solution of 1 gramme in 10 c.c. of Water should produce a red coloration under these conditions with 3 drops of the volumetric alkali solution. Assuming that the 3 drops are required, this would be equivalent to 1·3 p.c. of Lactic Acid. The majority of average commercial samples require considerably less. The Alcohol and Iodine tests are described below. Mineral matter, if present, may be detected by the residue left on ignition. The *B.P.* and the *U.S.P.* both require that it shall not leave more than ¼ p.c. of ash after ignition; the *P.G.* that 0·2 of a gramme of the specimen shall not leave a weighable residue.

Alcohol.—If a mixture of 15 grammes of Milk Sugar and 50 c.c. of diluted Alcohol be allowed to stand for half an hour with occasional agitation and then filtered, a filtrate is obtained 10 c.c. of which mixed with an equal volume of Absolute Alcohol should not become turbid and on evaporation on a water-bath should not leave more than 0·04 gramme of residue, *P.G.*; 1 gramme digested for half an hour, with intervals of occasional shaking, with 10 c.c. of Alcohol (48·9 p.c.), filtered, and the filtrate mixed with an equal volume of Absolute Alcohol should afford a clear mixture, which, when evaporated on a water-bath, should yield not more than 0·03 of a gramme of residue, indicating the absence of Cane Sugar, *U.S.P.*

Iodine.—If 1 gramme of Milk Sugar be boiled with 50 c.c. of Distilled Water for 5 minutes and the solution cooled, no blue coloration should be produced upon the addition of 1 drop of T.S. of Iodine, *U.S.P.*

SACCHARUM PURIFICATUM.

REFINED SUGAR.

B.P.Syn.—SUCROSE.

$C_{12}H_{22}O_{11}$, eq. 339·60.

FR., SUCRE BLANC OFFICINAL; GER., ZUCKER; ITAL., ZUCCHERO; SPAN.. AZUCAR.

Colourless, translucent, prismatic crystals, or a fine, white, crystalline powder, possessing a sweet characteristic taste. Permanent in the air. Obtained from the Juice of the Sugar-cane.

Solubility.—100 in 45 of Water, measures 113; 1 in 100 of Alcohol (20 p.c.).

Medicinal Properties.—Nutrient, demulcent, used in catarrhal affections in the form of Candy, Syrup, etc.; also in irritant corrosive poisoning. Employed almost entirely as a sweetening agent and as a preservative, and to assist the suspension of powders. It assists the solution of Lime in Water.

It is taken as a respiratory fuel by men about to undertake excessive physical exertion.

Official Preparation.—Syrupus. Sugar in some form is contained in all Syrups and Lozenges, several Confections, Mixtures, Pills and Powders.

Foreign Pharmacopœias.—Official in all except Norw. Fr. (Sucre Blanc Officinal), Ital. (Zucchero), Mex. (Azucar de Cana), Port. (Assucar), Span. (Azucar).

Tests.—Refined Sugar dissolves readily in Water, forming a clear solution which is neutral to Litmus paper; the *U.S.P.* states that the aqueous or alcoholic solution is neutral to Litmus paper, and the *P.G.* that aqueous and alcoholic solutions are neutral to Litmus paper. The *U.S.P.* states that an aqueous solution saturated at 25° C. (77° F.) should possess a sp. gr. of 1·340. A crystal of Sugar, when moistened with strong Sulphuric Acid, immediately chars and swells up, forming a black mass. When a few crystals are mixed with a little powdered Potassium Chlorate and touched with a drop of concentrated Sulphuric Acid, the mixture instantly ignites.

The more generally occurring impurities are insoluble salts, ultramarine, and Prussian blue. Glucose or Inverted Sugar, Calcium, Chlorides, Sulphates, and mineral matter. Insoluble salts, ultramarine, and Prussian blue, may be detected by the Water and Alcohol test described below. Heavy metals, such as Copper, Iron, Lead, and Zinc, may be detected by the addition of Hydrogen Sulphide to either a faintly acid solution or a solution rendered alkaline by Ammonia. The official directions for the detection of Glucose or Inverted Sugar are to heat the Syrup to a temperature of about 82·2° C. (180° F.) with Potassio-cupric Tartrate (Fehling's) Solution, or with Copper Sulphate Solution and an excess of Potassium Hydroxide Solution, when not more than a trace of red or yellowish precipitate should be produced; the *U.S.P.* employs the Silver Nitrate and Ammonia test described in the small type below. The Ammonium Oxalate, Silver Nitrate, and Barium Nitrate tests described below serve to detect Calcium, Chlorides, and Sulphates if present. It should leave scarcely any ash when ignited with free access of air. The *U.S.P.* makes no reference to the amount of ash, the *P.G.* states 0·5 of a gramme, when ignited, should leave no weighable residue.

Water and Alcohol.—One part by weight of Sugar should form, with 0·5 parts by weight of Water, a colourless, odourless syrup, possessing a purely saccharine taste and which mixes in all proportions with Alcohol (90 p.c.), *P.G.*

Both the aqueous and alcoholic solutions should be clear and transparent. When kept in large, well-closed and completely filled bottles, the solutions should not deposit a sediment on prolonged standing (absence of insoluble salts, ultramarine, Prussian blue, etc.), *U.S.P.*

Hydrogen Sulphide.—An aqueous solution (1–20) should not become turbid with T.S. of Hydrogen Sulphide, *P.G.*

Ammonium Oxalate.—An aqueous solution (1–20) should not become turbid more than opalescent with T.S. of Ammonium Oxalate, *P.G.*

Silver Nitrate.—An aqueous solution (1–20) should not become more than opalescent with T.S. of Silver Nitrate, *P.G.*

Silver Nitrate and Ammonia.—If 1 gramme of Sugar be dissolved in 10 c.c. of boiling Water, the solution mixed with 4 or 5 drops of Silver Nitrate T.S., then about 2 c.c. of Ammonia Water added, and the liquid quickly brought to the boiling point, not more than a slight coloration and no black precipitate should appear in the liquid after standing at rest for 5 minutes, *U.S.P.*

Barium Nitrate.—An aqueous solution (1–20) should not become more than opalescent with T.S. of Barium Nitrate, *P.G.*

Preparation.

SYRUPUS. Syrup.

Dissolve 10 of Sugar in 5 of boiling Distilled Water, and finally make up the total weight to 15.

9 measures of Syrup contain 8 of Sugar.

Foreign Pharmacopœias.—Official in all.

Tests.—Syrup has a sp. gr. of 1·330. It should be strongly dextrogyrate. A small quantity, when placed in a test-tube with some Potassio-cupric Tartrate (Fehling's) Solution, and heated in a water-bath, should yield no decided red precipitate. The Syrup should be neutral in reaction towards Litmus paper.

Not Official.

SALEP.

The prepared tubers of *Orchis Morio*, L., and other species of *Orchis*.

Medicinal Properties.—Mucilaginous and nutrient.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Swed. and Swiss.

MUCILAGO SALEP.—Powdered Salep 1; agitate well with cold Water 10; pour on this boiling Water 90, and stir till cold.

Foreign Pharmacopœias.—Official in Dutch, Ger., Jap., Norw., Russ., Swed. and Swiss, 1 in 100.

Salib Misri, the Salep of the Indian Bazaars, is derived from a species of *Eulophia*.

SALICINUM.

SALICIN.

$C_{13}H_{18}O_7$, eq. 283·99.

Fr., Salicine; Ger., Salicin; Ital., Salicina.

Colourless, tabular crystals, or slender, white, shining, acicular crystals, possessing a very bitter taste. It is a glucoside occurring naturally in the Bark and Leaves of various species of *Salix* and of *Populus*.

It should be kept in well-stoppered vehicles of a dark amber tint.

Jowett (*Report of the Wellcome Chemical Research Laboratories*; *J.C.S. Trans.* '00, 707; *Y.B.P.* '00, 117) states that it has been generally assumed that the different species of Willow Bark contain the same glucoside (Salicin), but having had occasion to examine a bark purchased as Black Willow he found that the crystalline principle obtained by the usual method for preparing Salicin was not that substance, but a new glucoside for which the name of Salinigrin was proposed. During the determination of the constitution of the new glucoside he established the interesting fact that, whilst Salicin is the glucoside of *o*-Hydroxybenzyl Alcohol, Salinigrin is the glucoside of *m*-Hydroxybenzaldehyde. Salinigrin can easily be distinguished from Salicin by affording a colourless solution with Sulphuric Acid, whilst Salicin, under similar conditions, produces a blood-red colour. The investigations by Jowett into the variations in the occurrence of Salicin and Salinigrin (*C.D.* '02, ii. 347; *Y.B.P.* '02, 490) in Willow and Poplar Barks, wherein a considerable number of authentic specimens of *Salix* and *Populus* from the chief European and American species were examined, showed that, of the 33 samples examined, Salinigrin was only found in 1, *Salix discolor*, Muhl.; that the amount of Salicin contained in the bark of the Willow or Poplar depends not only on the species, but on the season of the year at which it is collected, the sex of the tree, and possibly other factors; that the results of the investigation have shown that for practical purposes chemical assay alone can decide whether a Willow bark does or does not contain Salicin.

Solubility.—1 in 28 of Water; 1 in 82 of Alcohol (90 p.c.); insoluble in Ether.

Medicinal Properties.—Antipyretic, antiperiodic, tonic, and bitter stomachic; has been specially recommended in acute rheumatism. For the latter purpose it has been largely replaced by Sodium Salicylate, the action of which is more powerful, though not so well sustained, as Salicin; but the Salicylate has a greater tendency to cause cardiac depression, and is not so well tolerated by the stomach as Salicin. Has been recommended for the prevention and cure of influenza.

20-grain doses 3 times a day given with great success in a case of lupus erythematosus.—*L.* '02, ii. 157.

15-grain doses in psoriasis: the patches became paler, the scales more detachable and soon ceased to reform, while patch cleared in the centre, and finally the circle broke up.—*B.M.J.* '03, i. 656; *L.* '95, i. 1421; '03, i. 784.

15 grains every 4 hours relieved the irritation and arrested maturation of the vesicles in smallpox.—*B.M.J.* '00, i. 16, 512, 1337; '00, ii. 127; '02, ii. 179; *P.J.* '02, ii. 113.

Dose.—5 to 20 grains = 0·31 to 1·3 grammes.

Prescribing Notes.—*It is given in* **cachets.** *A good pill can be made by adding 'Diluted Glucose,' q.s.*

Effervescent Granules can be obtained containing 5 grains in each drm.

Not Official.—Saligenin, Salinigrin and Salix Nigra.

Foreign Pharmacopœias.—Official in Ital., Mex., Port. and U.S.

Tests.—Salicin melts, when pure, at 200° C. (392° F.). The *U.S.P.* gives the m.p. as 201·4° C. (394·5° F.), when still more strongly heated [240° C. (464° F.)] it decomposes. When moistened with Sulphuric Acid it is coloured red. When heated with a small quantity of Potassium Bichromate and a little Sulphuric Acid it evolves an odour of Salicylic Aldehyde, recalling the odour of Meadow-Sweet. When warmed in a test-tube until it turns brown the residue, when mixed with Water, yields, on the addition of Ferric Chloride T.S., a violet coloration. When evaporated to dryness with a few drops of Nitric Acid, and the yellow residue is treated with Ammonia Water, it yields, when heated on a water-bath with a small quantity of Potassium Cyanide, a blood-red coloration. It dissolves in Water, forming a solution which is colourless and neutral in reaction towards Litmus, and which is strongly lævogyrate. The *U.S.P.* states that, when moistened with Sulphuric Acid containing a trace of Molybdic Acid, a violet coloration changing to deep brownish-red is produced, and that Sulphuric Acid containing a trace of Potassium Iodide Solution yields a dark red coloration, changing to deep purple, and that Sulphuric Acid containing about one-fifth of its volume of Formaldehyde Solution produces a deep purplish-red colour. Salicin may be distinguished from alkaloids by yielding, when dissolved in Water, neither a precipitate with Potassio-mercuric Iodide (Mayer's) Solution, nor with Tannic nor with Picric Acid Solutions, nor the other usual reagents for alkaloids. When ignited with free access of air it should leave no residue; the latter requirement is common to both the *B.P.* and the *U.S.P.*

Not Official.

SALIGENIN.—Small, tabular crystals, having a very faint, sweetish taste, soluble in Water, readily soluble in Alcohol (90 p.c.) and in Ether. It is obtained by the action of Formic Aldehyde on Phenol in alkaline solution, or by the action of emulsin or of diluted mineral acids on Salicin. It has been recommended in acute rheumatism and in gout.—*P.J.* (3) xxv. 755, 1115; '95, ii. 175. **Dose.**—4 grains = 0·26 gramme.

SALINIGRIN.—Was found by Jowett (*J.C.S. Trans.* '00, 707) in an examination of a bark purchased as that of Black Willow, but which could not be, however, identified then as other than some species of *Salix*; the crystalline substance possessed a m.p. of 193° C. (379·4° F.) Corr. Its aqueous solution had an optical rotation of − 85°, the substance gave no coloration with Sulphuric Acid, on hydrolysis it yielded a crystalline Meta-hydroxybenzaldehyde.

SALIX NIGRA.—The Bark has been recommended as a sexual and general sedative.—*B.M.J.* '87, ii. 237; *L.* '88, i. 869.

The dose of the **Fluid Extract** (1 in 1) is 30 to 60 minims = 1·8 to 3·6 c.c.

SALOL.

PHENYL SALICYLATE.

$C_7H_5O_3.C_6H_5$, eq. 212·47.

Fr., Salicylate de Phényle; Ger., Phenylsalicylat; Ital., Salolo;
Span., Salicilato de Fenol.

Colourless, translucent, needle-shaped crystals, or a white crystalline powder, possessing a peculiar and characteristic aromatic odour, and but a slight taste. It is the Salicylic Ester of Phenyl.

Solubility.—1 in 12 of Alcohol (90 p.c.), 2 in 1 of Ether, 3 in 1 of Chloroform; 1 in 4 of Almond Oil; 1 in 10 of Liquid Paraffin. Insoluble in cold Water.

Medicinal Properties.—Antipyretic, antiseptic, and intestinal disinfectant. It passes through the stomach unchanged, and is decomposed into Carbolic and Salicylic acids by the alkalinity of the small intestine. It has been recommended in acute and chronic rheumatism, in cholera, in typhoid fever, in intestinal tuberculosis and in smallpox. One of the best antiseptics for intestinal dyspepsia and fermentation. Useful also as a urinary antiseptic. When given in excessive doses, or repeated frequently, has given rise to toxic symptoms. Externally it is used for the same purposes as Iodoform.

Combined with a blood tonic in anæmia, *M.A.* '95, 103; and pernicious anæmia, *L.* '94, ii. 1274; in diarrhœa of phthisis, *Pr.* liii. 275; in choleraic diarrhœa, *T.G.* '94, 40; good result in gonorrhœa, *L.* '90, i. 644; an intestinal and urinary disinfectant, *B.M.J.* '93, i. 643.

Owing to its low m.p. (about 108° F.=42° C.) it is useful in filling up irregular or superficial bone cavities; also as a stopping for carious teeth.—*B.M.J.E.* '96, i. 64; *P.J.* '95, ii. 216.

Formation of Salol calculus from its internal administration.—*B.M.J.* '97, ii. 78; *P.J.* '97, ii. 446.

Has been used (*L.* '04, ii. 1209) in 10-grain doses as an internal antiseptic in ulcerative colitis.

10 to 20-grain doses, either alone or in emulsion, with Castor Oil and Gum Acacia as an intestinal antiseptic in dysentery.—*I.M.G.* '05, ii. 281.

In compressed form it is less reliable than when given in suspension in Petroleum Emulsion.—*B.M.J.* '05, ii. 1703.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Prescribing Notes.—*It is given in* **cachets, mixtures, powders,** *or Compressed Tablets. In mixtures it should be suspended with Compound Tragacanth Powder; but it is best dissolved in a fixed Oil, and emulsified by Gum Acacia* (see below *Emulsio Salol*). *Salol with $\frac{1}{8}$ of Compound Tragacanth Powder, will make a good pill with 'Diluted Glucose.'*

A good **mouth-wash** *can be made by dissolving* 60 *grains of Salol in* 6 *fl. oz. of Alcohol* (90 *p.c.*), *and adding* 10 *minims of Oil of Peppermint and* 5 *minims of Oil of Anise. It can, if desired, be sweetened with an addition of $\frac{1}{10}$ grain of Saccharin.*

Not Official.—Emulsio Salol, Pommade de Salicylate de Phényle, Salol Camphor, Salol Mouth-wash, Salol Varnish for Pills, and Salophen.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S.

Tests.—Commercial Salol melts at 41·37° C. (106·46° F.); dried Salol melts at 42·53° C. (108·55° F.); purified Salol melts at 42·47° C. (108·44° F.). The *B.P.* gives the m.p. as 42° to 43° C. (107·6° to 109·4° F.). The *U.S.P.* and the *P.G.* 42° C. (107·6° F.). It dissolves readily in Alcohol, the alcoholic solution being neutral in reaction towards Litmus paper, and yielding on the addition of Bromine Solution a white precipitate, and on the addition of Ferric Chloride T.S. a violet coloration. The *U.S.P.* and the *P.G.* both employ diluted Ferric Chloride Solution in carrying out this test. When dissolved in a little warm Sodium Hydroxide Solution it yields when cooled and acidified with diluted Sulphuric Acid a white precipitate, and on warming, an odour of Phenol. The *B.P.* states that when Salol is melted with Sodium Hydroxide and acidulated with Hydrochloric Acid a white precipitate is produced and Phenol is evolved. The object in using solid Sodium Hydroxide, when Potassium or Sodium Hydroxide Solution is equally convenient and far less troublesome, is not apparent. The separated Salicylic Acid, when washed and carefully dried should possess the m.p. and answer the tests distinctive of Salicylic Acid given under Acidum Salicylicum.

Bearing in mind the fact that Phenol forms no chemical combination with Sodium Hydroxide in the true sense of the term, any alkali Hydroxide being titratable with Normal Acid Solution as if no

Phenol were present, and with a standard acid forms a salt neutral to Phenolphthalein Solution, the author has suggested (*P.J.* '05, i. 720) a convenient method for approximately determining the purity of a salt by the Saponification equivalent:—A weighed quantity of 0·5 of a gramme of the sample is carefully weighed out into a flask, 5 c.c. of Normal Volumetric Sodium Hydroxide Solution added, and 10 c.c. of Water, the mixture saponified on a water-bath; it is cooled, the excess of Normal Volumetric Sodium Hydroxide Solution titrated with Tenth-normal Volumetric Sulphuric Acid Solution. A carefully measured 5 c.c. of the Normal Alkali Solution is treated in an exactly similar manner as a blank experiment, the difference of the number of c.c. of Tenth-normal Volumetric Sulphuric Acid Solution required for the specimen and that required in the blank experiment is calculated into terms of Phenyl Salicylate. 1 c.c. of Tenth-normal Sodium Hydroxide Solution absorbed represents 0·005571 gramme of Potassium Hydroxide or 0·021247 gramme of Phenyl Salicylate.

The more generally occurring impurities are uncombined Salicylic Acid or Phenol, Sulphates and Chlorides. The free acid, if present, may be detected by the behaviour of the sample or its solution towards blue Litmus paper. When shaken with 50 times its weight of Water and filtered the filtrate should neither afford a blue nor a violet coloration with diluted Ferric Chloride T.S. (the *B.P.* says Ferric Chloride Solution), nor should it produce a turbidity with Silver Nitrate or Barium Chloride Solutions. When heated with free access of air it should leave no weighable residue. The *P.G.* states that 0·1 of a gramme when ignited shall leave no weighable residue.

Ferric Chloride.—If 1 gramme of Phenyl Salicylate be shaken with 50 c.c. of Water and filtered; and if 5 drops of Ferric Chloride T.S., previously diluted with 20 volumes of Water be added to the filtrate, the latter should show either no colour or at most a trace, *U.S.P.* Also given in the *P.G.*, which states that the filtrate should not be affected.

Barium Nitrate.—A filtrate obtained as above should be unaffected by T.S. of Barium Nitrate, *P.G.*; should show no turbidity, *U.S.P.*

Silver Nitrate.—Another portion of a filtrate as above should be unaffected by T.S. of Silver Nitrate, *P.G.*; should show no turbidity, *U.S.P.*

Not Official.

EMULSIO SALOL.—Salol, 40 grains: Almond Oil, 4 fl. drm.; Powdered Gum Acacia, 120 grains; Syrup, 2 fl. drm.; Peppermint Water, to 2 fl. oz.

POMMADE DE SALICYLATE DE PHÉNYLE.—Phenyl Salicylate, 1; Vaseline, 9.—*Fr.*

SALOL CAMPHOR.—Prepared by moistening 1 of Camphor with Alcohol and triturating it with $1\frac{1}{2}$ Salol till a transparent liquid is obtained. Has been found useful in treament of furuncles and carbuncles.—*B.M.J.E.* '95, ii. 84.

SALOL MOUTH-WASH.—Salol, 60 grains; Oil of Peppermint, 10 minims; Oil of Anise, 5 minims; Alcohol (90 p.c.), to 6 fl. oz. It can, if desired, be sweetened with an addition of $\frac{1}{10}$ grain of Saccharin.

A modification appears in the *B.P.C.*, under the title **Liquor Salolis Compositus,** with the synonym Salol Mouth-Wash as follows:—

Salol, 2·50; Thymol, 0·25; Spirit of Anise, 1; Oil of Peppermint, 0·50; Elixir of Gluside, 2·50; Alcohol, *q.s.* to produce 100.

SALOL VARNISH FOR PILLS.—Salol, 2; Shellac, 3; Absolute Alcohol, 3; Ether, 3.—*Martindale.*

This has been incorporated in the *B.P.C.* under the title **Solutio Salolis Etherea,** with the synonym Salol Pill Varnish as follows:—

Salol, 20; Shellac, 30; Ether, 30; Absolute Alcohol, *q.s.* to produce 100.

SALOPHEN. Acetylparamidophenol Salicylate $C_{15}H_{13}NO_4$, eq. 269·11.—A white, crystalline powder, insoluble in Water, soluble in Alcohol and in Ether.

It appears in the *Fr. Codex* (1908) under the title of Acétylpara-aminosalol.

Medicinal Properties.—Analgesic and antipyretic. Has been recommended in acute and subacute rheumatism, and in neuralgia.

Dose.—10 to 30 grains = 0·65 to 2 grammes, usually given in cachets.

Official in Belg., Fr., Mex., Swed. and Swiss.

Tests.—Salophen melts at 187° to 188° C. (368·6° to 370·4° F.); *Fr. Codex* gives 188° C. (370·4° F.). It dissolves in Alcohol, forming a solution which is faintly acid towards Litmus paper, and which is coloured violet by the addition of Ferric Chloride T.S., and which produces a voluminous white precipitate with Bromine Solution. It dissolves without change of colour in concentrated Sulphuric Acid. Potassium or Sodium Hydroxide Solution readily decomposes it into Salicylic Acid and Acetyl-para-amidophenol. The *Fr. Codex* includes a test for the acetyl radicle, requiring that when moderately heated with a mixture of Alcohol and Sulphuric Acid it shall evolve an odour of Acetic Ether. The liberated Salicylic Acid, when separated, washed and carefully dried, should possess the m.p. and respond to the tests characteristic of Salicylic Acid given under Acidum Salicylicum.

SAMBUCI FLORES.

ELDER FLOWERS.

FR., SUREAU; GER., HOLUNDERBLÜTHEN; ITAL., SAMBUCO; SPAN., SAUCO.

The Flowers of *Sambucus nigra*, L., separated from the stalks.

Descriptive Notes.—The official description does not specify whether the Elder flowers should be fresh or not, but under Aqua Floræ Sambuci the fresh flowers are ordered. The flowers should be separated from the flower stalks. In the West of England the dried flowers are commonly sold as a remedy for catarrh, the whole inflorescence being dried. The flowers readily blacken if left in heaps, and need to be quickly dried in a current of warm air in order to keep their colour. The small rotate corolla is nearly white when fresh, but dull yellowish-white when dried. The anthers are yellow; in the only other British species, *S. Ebulus*, they are pink. The fresh flowers have a slightly bitter taste and a faint but characteristic odour. In the United States the allied species *S. Canadensis*, L., was official, and is still in use. It differs from the British species chiefly in the leaves having 3 to 4 pairs of leaflets and in being sometimes bipinnate, but the flowers present no marked difference.

Official Preparation.—Aqua Sambuci.

Not Official.—Unguentum Sambuci, Unguentum Sambuci (Viride).

Foreign Pharmacopœias.—Official in all except U.S. Fr. (Sureau) Ital. (Sambuco); Mex. and Span. (Saúco); Port. (Sabugueiro).

Preparation.

AQUA SAMBUCI. Elder-Flower Water.

Fresh Elder Flowers, 1 (or an equivalent quantity of the Flowers preserved whilst fresh with Common Salt); Water, 5; distil 1. (1 in 1)

Chiefly used for **lotions** and **collyria.**

Not Official.

UNGUENTUM SAMBUCI.—Elder Flowers, fresh; Lard, of each, 16 oz. Boil the Elder Flowers in the Lard until they become crisp; then press through a linen cloth.—*P.L.* 1851.

This has been incorporated in the *B.P.C.*

UNGUENTUM SAMBUCI (VIRIDE).—Elder Leaves, fresh, 3; Prepared Lard, 4; Prepared Suet, 2; boil the leaves with the Lard till they become crisp, strain, express, add the Suet and melt them together.—*Dublin Pharm.*

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Port. 1 in 4.

SANTALI OLEUM.

OIL OF SANDAL WOOD.

B.P.Syn.—Oil of Santal Wood.

Fr., Essence de Santal; Ger., Sandelöl; Ital., Essenza di Sandalo; Span., Esencia de Sandalo.

A pale yellow, or yellow, somewhat viscid, oily liquid, having a characteristic, persistent, aromatic odour, and unpleasant, nauseous taste.

It should be kept in well-closed bottles of a dark amber tint in a cool atmosphere and protected as far as possible from contact with the light.

It is distilled from the Wood of *Santalum album*, L.

East Indian Sandal Wood Oil is alone official in the *B.P.*; the *U.S.P.* requires the Oil to contain not less than 90 p.c. of alcohols calculated as Santalol, the *P.G.* does not state the necessary proportion of Santalol.

The chief constituent of the Oil is an alcohol Santalol, which is capable of determination by acetylisation.

Solubility.—In less than its own weight of Alcohol (90 p.c.).

Medicinal Properties.—A stimulating disinfectant to the mucous membranes of the bladder and urethra, and also of the bronchial mucous membrane; prescribed extensively for subacute and chronic gonorrhœa; it is best taken about an hour and a half after meals.

Dose.—5 to 30 minims = 0·3 to 1·8 c.c.

Prescribing Notes.—*Generally given in* **capsules** *or in a* **mixture** *suspended with Mucilage of Acacia, or Tragacanth. It is best taken in Capsules, as the taste is nauseous. Sometimes prescribed with Buchu and Cubebs.*

Not Official.—Capsules of Sandal Oil, Liquor Santali Compositus, Mistura Olei Santali, Mistura Santali Composita, Mistura Santali Composita cum Morphina, Mistura Olei Santali, Gonal and Santyl.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr., Ger., Jap., Norw., Span., Swiss and U.S.

Tests.—Sandal Wood Oil has a sp. gr. of 0·975 to 0·985. The *B.P.* states 0·975 to 0·980; the *U.S.P.* 0·965 to 0·980 at 25° C. (77° F.); the *P.G.* 0·975 to 0·985. It is officially required to dissolve in six times its volume of Alcohol (70 p.c.), to form a clear solution, but it must be remembered that the solubility of the Oil decreases with age and that an Oil which has been kept a considerable time or which has been badly preserved may not give a clear solution. The *U.S.P.* requires that it should dissolve in 5 volumes of Alcohol (70 p.c.) presumably at 25° C. (77° F.). The *P.G.* is more specific with regard to the temperature at which solution in this volume of Alcohol is required to take place, and states that it shall dissolve in 5 parts, by weight, of Alcohol (68 to 69 p.c.) at 20° C. (68° F.) to form a clear solution possessing a faintly acid reaction. The temperature at which solution is required to be effected should have been mentioned in the *B.P.*, as it makes a considerable difference whether the solubility figure is determined at 15·5° C. (60° F.), 20° C. (68° F.) or 25° C. (77° F.). It is lævogyrate, the optical rotation being from $-16°$ to $-20°$ in a tube of 100 mm. length. These are the figures required by the *B.P.* The *U.S.P.* requires that the optical rotation should not be less than $-16°$ nor more than $-20°$ in a 100 mm. tube at a temperature of 25° C. (77° F.). The *P.G.* does not state the optical rotation. Considerable controversy has raged round the question of the optical rotation, it being contended that specimens of undoubted purity (English distilled) are occasionally outside these limits, and rotations of $-14°$ to $-22°$ have been recorded. The majority of evidence appears to be in favour of the $-16°$ to $-20°$ limit, it not being considered a good policy to widen the official limits in order to include a few exceptional oils possessing a rotation outside the above limits. The optical rotation has been considered fallacious in judging the purity of an Oil, but it must be recollected that it frequently supplies important information as to the nature of the substance with which an Oil is adulterated. The refractive index should be not below 1·503. The alcohol-content of the Oil calculated in terms of Santalol should not fall below 90 p.c. Neither the *B.P.* nor the *P.G.* gives a requisite Santalol content, the *U.S.P.* requires that it shall contain not less than 90 p.c. of alcohols calculated as Santalol, as determined by the process given in small type below. A Santalol determination figure, possibly 94 p.c. as a minimum, has been suggested for inclusion in the *B.P.* All authorities are agreed that the Santalol content for a genuine Oil should not fall below 90 p.c., but the majority consider that although the total amount of Santalol present in Oils of undoubted purity rarely falls below 94 p.c., the standard is somewhat too high for official adoption, and that it would be wiser to adopt the standard suggested by Parry and Schimmel of at least 90 p.c. Besides the alcohol, Santalol, the Oil also contains esters of that Alcohol present chiefly in the form of Acetate; their percentage varies from 2 to 6 p.c. and they may be determined by saponifying a known weight of the Oil with Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution, titrating the excess of the latter solution with Semi-normal Volumetric Sulphuric Acid Solution, using Phenolphthalein Solution as an indicator of neutrality. The number of c.c. of Semi-normal Volumetric Alcoholic Potassium Solution absorbed by the Oil multiplied first by 0·1301 and then by 100, and the product divided by the weight of Oil taken, yields the percentage of esters in terms of Santalol Acetate. Neither the *B.P.*, the *U.S.P.* nor the *P.G.* includes figures for an ester content. In carrying out the volumetric determination of Santalol-content, in the place of washing the acetylised Oil with Water, whereby, owing to the formation of an emulsion, a fair quantity of the Oil is lost, it has been suggested (*Proc. Amer. Pharm. Assoc.* '06, 887) that a 10 p.c. Sodium Chloride Solution should be used. The formula by which the Santalol content should be calculated is also a matter of importance. Schimmel states that Santalol is correctly represented by the formula $C_{15}H_{24}O$, which is the only one which ought to come under consideration.

The more generally occurring impurities are Oils derived from other varieties of Sandal Wood, Cedar Wood Oil, Castor Oil, or other fixed Oils and Rosin. The *U.S.P.* includes a test for chlorinated products, which is described under Silver Nitrate. The solubility of the Oil in Alcohol (70 p.c.) detects the presence of Castor Oil or other fixed Oils or West Indian Sandal Wood Oil. Cedar Wood Oil, Castor Oil or fixed Oils and Rosin may also be detected by the Acid and Ester values and the decrease in the optical rotation, as well as by the diminution in the percentage of Santalol. It is stated (*Analyst*, '95, 174) that genuine Sandal Wood Oil gives with Bromide of Tin (*see* Oleum Lini) a red coloration, whilst West Indian Sandal Wood Oil gives a blue or a green colour. The paucity of information contained in the official monograph suggests a recommendation to the effect that the *B.P.* monograph requires revision.

Silver Nitrate.—If a small strip of of filter paper folded in the form of a taper and saturated with Oil of Santal be placed in a small porcelain dish, and a clean beaker moistened on the inner surface with Distilled Water be inverted over the small dish immediately after igniting the taper, a part of the products of combustion will be absorbed by the Water; if the beaker be then rinsed with a little Distilled Water and the liquid filtered, the filtrate should yield no turbidity upon the addition of a few drops of Silver Nitrate T.S., *U.S.P.*

Volumetric Determination of Santalol.—A measured quantity of 10 c.c. is introduced into an acetylisation flask, together with 10 c.c. of Acetic Acid Anhydride, and about 2 grammes of anhydrous Sodium Acetate, and the mixture is boiled gently for 1½ hours, when cool the acetylised Oil is washed first with Distilled Water and subsequently with Sodium Hydroxide T.S., until the mixture is faintly alkaline to Phenolphthalein T.S., and it is then dried by means of fused Calcium Chloride. Filter and transfer 3 c.c. of the dried acetylised Oil into a flask having a capacity of 100 c.c., and after having ascertained accurately the weight, saponify by boiling gently for 1 hour under a reflux condenser with 50 c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution, titrating the excess of the latter with Semi-normal Volumetric Sulphuric Acid Solution, employing Phenolphthalein Solution as an indicator of neutrality. The number of c.c. of Semi-normal Volumetric Sulphuric Acid Solution required is subtracted from 50, the difference is multiplied by 11·026 and the product divided by the weight of the dry acetylised Oil employed (minus the number of c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution absorbed by the acetylised Oil multiplied by 0·021), the quotient corresponds to the p.c. of Santalol present in the sample.—*U.S.P.*

Not Official.

CAPSULES OF SANDAL OIL.—Containing 10 and 20 minims in each.

The Oil used in these capsules is frequently adulterated, Castor Oil, flavoured with Sandal Wood Oil, has been used for this purpose, but, of course, is readily detected. The favourite adulteration is Oil of West Indian Sandal Wood, this has been reported (*C.D.* '06, i. 211) in specimens of capsules manufactured in London, it may be recognised by tests given under Oleum Santali.

LIQUOR SANTALI COMPOSITUS.—Sandal Wood Oil, 1; Soluble Solution of Copaiba, 22; Spirit of Cinnamon, ½; Tincture of Buchu (1 in 5 S.V.R.), 3½; Tincture of Cubebs (1 in 5 S.V.R.), 3.—*Pharm. Form.*

Oil of Sandal Wood, 5; Spirit of Cinnamon, 2·50; Tincture of Buchu, 17; Tincture of Cubebs, 15; Alcohol, *q.s.* to produce 100.—*B.P.C.*

MISTURA OLEI SANTALI.—Oleum Santali, 30 minims; Mucilage of Acacia, 1 fl. drm.; Syrup, 1 fl. drm; Tincture of Orange, 30 minims; Water, to 1 fl. oz., for a dose 3 times a day.—*Squire.*

Mistura Olei Santali.—Oil of Sandal Wood, 15 minims; Mucilage of Gum Acacia, 30 minims; Cinnamon Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

MISTURA SANTALI COMPOSITA.—Sandal Wood Oil, 12½ drm.; Oil of Cassia, 1½ drm.; Oil of Pimento, 40 minims; Rectified Spirit, 3½ oz. (Nisbet's Specific).—*Pharm. Form.*

Oil of Sandal Wood, 30; Oil of Cassia, 3·50; Oil of Pimento, 1·50; Alcohol, *q.s.* to produce 100.—*B.P.C.*

MISTURA SANTALI COMPOSITA CUM MORPHINA.—Sandal Wood Oil, 4 oz.; Oil of Pimento, 4 drm.; Oil of Cassia, 2 drm.; Morphine Muriate, 9 grains; Rectified Spirit, to produce 12 oz. (Nisbet's Specific).—*Pharm. Form.*

Oil of Sandal Wood, 35; Oil of Cassia, 2·25; Oil of Pimento, 4·50; Morphine Hydrochloride, 0·15; Alcohol, *q.s.* to produce 100.—*B.P.C.*

GONAL.—A colourless, oily liquid, sp. gr. 0·978 to 0·980, containing the alcohol constituents of Sandal Wood Oil. It has a faint odour of the latter. An irritating, sesquiterpene Santalene is stated to be removed during its preparation. Introduced as a purified Sandal Wood Oil, and recommended for urethritis and gonorrhœa. **Gonoral** was a somewhat similar preparation.—*B.M.J.* '01, i. 1407; '01, ii. 512; *P.J.* '99, ii. 34; '00, i. 333.

SANTYL.—A clear, yellow fluid of an oily consistency, possessing a faint odour and taste of Sandal Wood. It is practically insoluble in Water, but dissolves in Alcohol (90 p.c.) and in Ether. It is stated to be a neutral Santalol Salicylic Ester, and to contain 60 p.c. of Santalol. It was introduced as a urinary antiseptic, and is stated to be of value in acute gonorrhœa and its complications, being comparatively free from the somewhat objectionable odour and taste of Sandal Wood Oil. It is stated not to cause eructations, nor to impart a Sandal Wood odour to the breath. It may be given in doses of 30 drops taken 3 times daily, preferably in Milk or in the form of Capsules, 2 capsules being taken 4 times a day.

SANTONINUM.

SANTONIN.

$C_{15}H_{18}O_3$, eq. 244·29.

Fr., Santonine; Ger., Santonin; Ital., Santonina; Span., Santonina.

Colourless, odourless, pearly, hexagonal prisms, possessing a faint bitter taste. It is a crystalline principle, which is prepared from Santonica, or Worm-Seed, the dried, unexpanded Capitula or

Flower-Heads of *Artemisia maritima.* The *U.S.P.* describes it as an inner Anhydride or Lactone of Santonic Acid obtained from Santonica.

It should be kept in well-closed bottles of a dark amber tint and protected as far as possible from the light, as it acquires, when exposed to the light, more particularly to direct sunlight, a yellow colour.

Solubility.—Sparingly in Water; 1 in 350 of boiling Water; 1 in 50 of Alcohol (90 p.c.); 1 in 4 of boiling Alcohol (90 p.c.); 1 in 160 of Ether; 1 in 2 of Chloroform; about 1 in 400 of Olive Oil; slightly in Glycerin and in Solution of Potassium Hydroxide.

Medicinal Properties.—Anthelmintic. Useful both for round worms and thread-worms. It frequently affects the vision, causing all objects to appear yellow or green; to avoid this unpleasantness, Santonin is given at night, the disturbance of vision then remains only for half an hour or so, after the patient awakes in the morning.

Apart from its tænicide action, it is stated to possess valuable antispasmodic properties.—*P.J.* '04, ii. 967; *C.D.* '04, ii. 1052. It is useful in certain nervous affections, in epilepsy, and against tabetic pains.

A case of a child age 3½ years, is recorded, in which, after it had received at intervals during 40 hours several 'worm lozenges' containing Santonin, a fatal issue ensued. A little over 1 grain of Santonin had thus been taken, or about half the maximum dose for a child of 2 years per day. Other cases have been recorded in which equally small doses have produced toxic effects.—*Edin. Med. Jour.* '08, i. 183.

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Ph. Ger. maximum single dose, 0·1 gramme; maximum daily dose, 0·3 gramme.

Prescribing Notes.—*About 3 doses are sufficient; 1 every other night followed by a brisk cathartic the morning after each dose. The suppository is useful in thread-worms.*

Castor Oil has been recommended as a solvent for Santonin, but it will not dissolve 1 in 100; even if heat be applied, part of the Santonin will crystrallise out on cooling.

Official Preparation.—Trochiscus Santonini.

Not Official.—Suppositorium Santonini, Pulvis Santonini Compositus Infantilis, Pulvis Santonini et Scammonii, and Artemisin.

On account of the similarity in crystalline form, and in consequence of several accidents due to the contamination of Santonin with Strychnine, *Ger.* and *U.S.* include a test for the latter substance.

Foreign Pharmacopœias.—Official in all.

Tests.—Santonin melts at 170° C. (338° F.), and if cautiously heated it may be sublimed unchanged; the *U.S.P.* gives the m.p. as 170·3° C. (338·5° F.); the *P.G.* 170° C. (338° F.). When more strongly heated it acquires a reddish-brown colour, evolving white fumes. It is soluble in Potassium or Sodium Hydroxide Solutions, and when added to a warm alcoholic Solution of the former it yields a violet-red coloration. It dissolves in Alcohol, the solution being lævogyrate and neutral in reaction towards Litmus paper. When moistened with Sulphuric Acid or Nitric Acid no coloration is produced. It is insoluble in diluted mineral acids. If 0·1 of a gramme be shaken with 1 c.c. of a cold mixture of Sulphuric Acid, and 1 c.c. of Water, no coloration should be produced, but on heating to 100° C. (212° F.), the addition of a drop of diluted Ferric Chloride T.S. a purple-violet coloration is produced, changing to brown on long continued heating. Crystals of Santonin are somewhat similar in appearance to Strychnine, and in fact have been mistaken for that substance, and tests for Strychnine, Brucine and alkaloids have been inserted in the *U.S.P.* and *P.G.* The test for Strychnine and Brucine is described under the heading of Potassium Bichromate, and the test for other alkaloids under the heading of Mercuric Potassium Iodide or Iodine in small type below. When ignited with free access of air it should leave no residue, indicating the absence of mineral impurity. The *U.S.P.* states that when ignited it is consumed, leaving no residue, and the *P.G.* that 0·2 of a gramme of the substance shall leave no residue when ignited.

Potassium Bichromate.—If Santonin be boiled with 100 parts of Water and 5 parts diluted Sulphuric Acid, after cooling and subsequently filtering it gives a filtrate without any bitter taste, and in which the addition of a few drops of Potassium Bichromate T.S. does not produce a precipitate, *P.G.*

Mercuric Potassium Iodide or Iodine—If 2 grammes of Santonin be boiled with 80 c.c. of Water and 5 c.c. of Diluted Sulphuric Acid, and the liquid, after frequent shaking be allowed to become cold and then filtered, Mercuric Potassium Iodide T.S. or Iodine T.S., should produce no cloudiness in 10 c.c. of the filtrate, mixed with 10 c.c. of Distilled Water, even after standing for 3 hours (absence of alkaloids), *U.S.P.*

Preparation.

TROCHISCUS SANTONINI. SANTONIN LOZENGE.

1 grain of Santonin in each lozenge, with Simple Basis.

Dose.—1 to 5 lozenges.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Ger., Ital., Mex., Norw., and Swiss, each containing $\frac{3}{8}$ grain; Dan., Russ., Swed. and U.S. $\frac{1}{2}$ grain; Fr. and Port., $\frac{1}{6}$ grain; Jap. and Span., $\frac{1}{3}$ grain. Not in Hung.

Not Official.

SUPPOSITORIUM SANTONINI.—Santonin 3 grains, with Oil of Theobroma.

PULVIS SANTONINI COMPOSITUS INFANTILIS.—Santonin, 1 grain; Calomel, $\frac{1}{2}$ grain; Compound Powder of Scammony, $2\frac{1}{2}$ grains.—*London.*

PULVIS SANTONINI ET SCAMMONII.—Santonin, 1 grain; Compound Powder of Scammony, 2 grains.—*Victoria.*

Artemisin (Oxysantonin) occurs in colourless crystals, becoming yellow on exposure to light, and is extracted from the mother liquors after separating the Santonin.—*P.J.* '02, i. 294, 489; *C.D.* '02, i. 14.

15 grains given in 3 doses at intervals of 3 hours to relieve the lightning pains of tabes.—*B.M.J.E.* '01, i. 80; *T.G.* '01, 613.

SAPO ANIMALIS.

CURD SOAP.

FR., SAVON ANIMAL; GER., HAUSSEIFE; ITAL., SAPONE ANIMALE; SPAN., JABON ANIMAL.

A white or whitish solid, possessing a characteristic appearance, dry and saponaceous to the touch. It is prepared by the saponification of a purified animal fat with Sodium Hydroxide.

Sapo Animalis is described in the *P.G.* under the title of Sapo Medicatus, it is not official in the *U.S.P.*

For the purpose of powdering it is not affected injuriously by drying at a temperature of 212° F. (100° C.).

Solubility.—Sparingly in Water; 1 in 1½ of boiling Water; partially in Alcohol (90 p.c.); almost entirely, 1 in 2 of boiling Alcohol (90 p.c.).

Official Preparations.—Used in the preparation of Extractum Colocynthidis Compositum, Linimentum Potassii Iodidi cum Sapone, and Pilula Scammonii Composita.

Foreign Pharmacopœias.—Official in Austr. (Sapo Medicinalis); Belg. (Sapo Stearinicus); Norw. (Sapo Butyraceus); Fr., (Savon Animal); Hung. (Sapo Albissimus Droguistarum); Ital. (Sapone Animale); Port. (Sabao Animal); Russ. (Sapo Sebacinus); Mex. and Span. (Jabon Animal); Swiss (Sapo Stearinicus); Ger., Jap. and Russ. (Sapo Medicatus), made with Lard and Olive Oil.

Emplastrum Saponis.—Formerly made with Curd Soap; now made with Hard Soap. *See* Sapo Durus.

Tests.—Curd Soap dissolves sparingly in Water and readily in boiling Water, is sparingly soluble in Alcohol (90 p.c.). The *B.P.* requires that it shall contain no free alkali Hydroxide as determined by dissolving a weighed quantity of 5 grammes of the dried and powdered Soap in boiling Alcohol (90 p.c.), filtering whilst hot and washing the filter with boiling Alcohol (90 p.c.), using Phenolphthalein Solution as an indicator of neutrality. It is officially required to contain not more than 0·3 p.c. of alkali (Sodium) Carbonate as determined by dissolving in Water the residue resulting from the filtration of the boiling alcoholic solution of the Soap and washing with boiling Alcohol (90 p.c.). This aqueous solution is titrated with Tenth-normal Volumetric Sulphuric Acid Solution, using Phenolphthalein Solution as an indicator of neutrality; not more than 3 c.c. of the Tenth-normal Sulphuric Acid Solution shall be required; 1 c.c. of the latter solution is equivalent to 0·00526 gramme of anhydrous Sodium Carbonate. The use of Phenolphthalein Solution as an indicator of neutrality will necessitate the boiling of the solution to dispel the Carbonic Anhydride. It would have been preferable to have used Methyl Orange Solution as an indicator, when the titration could have been carried out directly. If it is desired to ascertain the amount of alkali combined with the fatty acids in the form of a Soap, a few drops of Lacmoïd Solution may be added and the titration continued until a red coloration is produced. The number of c.c. of Tenth-normal

Volumetric Acid Solution used may be calculated into Sodium Oxide, 1 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution is equivalent to 0·00308 gramme of Sodium Oxide. The *P.G.* requires that a solution of 1 gramme of Soap and 5 c.c. of Alcohol (90 p.c.) shall not acquire a red coloration on the addition of 1 drop of Phenolphthalein Solution. The *B.P.* includes no mention of the characters of the fatty acids obtained when an aqueous solution of the Soap is acidified with Diluted Sulphuric Acid, and the resulting fatty acids are filtered through a filter paper moistened with Water, washed till free from mineral acids and dried. They should possess the m.p. of about 45° C. (113° F.), an Iodine absorption of about 40 to 45 p.c., and a combining weight of about 278 to 280.

The more generally occurring impurities are the presence of an excess of alkali Hydroxide, an excessive amount of alkali Carbonate, unsaponified oil or fat, Potassium Soap or excess of moisture. The behaviour of the filtered boiling Alcoholic Solution towards Phenolphthalein Solution and the titration of the hot aqueous solution of the residue left on the filter ensures the absence of free alkali Hydroxide, or an excessive amount of alkali Carbonate. Unsaponified oil or fat, if present, may be detected by a greasy stain being imparted by the Soap to white unglazed paper. The deliquescent nature of the ash remaining on ignition indicates the presence of Potassium Soap. It is officially required to lose when dried at a temperature of 110° C. (230° F.) about 30 p.c. of moisture. The *P.G.* requires that Hydrogen Sulphide Solution shall produce no change in a solution of 1 gramme of the Soap in 5 c.c. of Alcohol (90 p.c.).

SAPO DURUS.

HARD SOAP.

FR., SAVON MEDICINAL; GER., MEDIZINISCHE SEIFE; ITAL., SAPONE MEDICINALE; SPAN., JABON DE ACEITE DE OLIVAS.

A solid, answering to the description given under 'Sapo Animalis,' but made by saponifying Olive Oil with Sodium Hydroxide. It is officially permitted to contain about 30 p.c. of Water.

Sapo Animalis is essentially Sodium Stearate, and Sapo Durus is essentially Sodium Oleate, but no confirmatory tests appear in the Pharmacopœia.

Solubility.—The greater part is soluble 1 in 20 of Water; entirely 1 in 1½ of boiling Water; 1 in 2 of boiling Alcohol (90 p.c.).

30 grains of White Castile Soap digested for 4 days in 1 oz. of cold Alcohol (90 p.c.), only 24 grains were dissolved; when heated it all dissolved.

Medicinal Properties.—Laxative and antacid. Combined with Rhubarb, it is administered as an antacid in dyspepsia attended with constipation. Large and frequent doses are most effective in removing gall-stones. Hard Soap, but more frequently Soft Soap, is made into a lather with warm Water, for use as an enema, ½ to 1 oz. to a pint.

The **Liniment**, which is made with soft soap, is used as a counterirritant, and is useful in sprains and rheumatic pains, and stiffness of joints.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Prescribing Notes.—*Best given in* **wafer paper** *or in* **cachets.**

Official Preparations.—Emplastrum Saponis, and Pilula Saponis Composita. Contained in Emplastrum Resinæ, Pilula Aloes Barbadensis, Pilula Aloes et Asafetidæ, Pilula Aloes Socotrinæ, Pilula Cambogiæ Composita, Pilula Rhei Composita, Pilula Scillæ Composita. Used in the preparation of Hydrargyri Oleas and Unguentum Zinci Oleatis. Soap Plaster is contained in Emplastrum Calefaciens, and Emplastrum Cantharidis.

Not Official.—Linimentum Saponis, Spiritus Saponatus, Eunatrol.

Foreign Pharmacopœias.—Official in Belg. (Sapo Officinalis); Dan. and Dutch (Sapo Medicatus); Hung. (Sapo Venetus); Norw. (Sapo Albus Oleaceus); Russ. (Sapo Hispanicus Albus); Span. (Jabon de Sosa); Swed. (Sapo Medicatus); Swiss (Sapo Oleaceus); U.S. (Sapo). With **Almond Oil**—Fr. (Savon Médicinal); Hung. (Sapo Medicinalis); Ital. (Sapone Medicinale); Mex. (Jabon Medicinal); Port. (Sabao Vegetal); Span. (Jabon Amigdalino). With **Lard** and **Olive Oil**—Ger., Jap. and Russ. (Sapo Medicatus).

Tests.—Hard Soap dissolves in Water, and readily in boiling Water and in boiling Alcohol. The *B.P.* requires that it shall not contain any free alkali Hydroxide as determined by digesting a weighed quantity of 5 grammes of the dried and powdered Soap in boiling Alcohol (90 p.c.), and whilst still hot filtering the solution through a filter and thoroughly washing it with boiling Alcohol (90 p.c.); the resultant filtrate should not produce a pink coloration with Phenolphthalein Solution. It also requires that it shall contain not more than 0·3 p.c. of alkali (Sodium) Carbonate as determined by titrating the residue from the above alcoholic solution with Tenth-normal Volumetric Sulphuric Acid Solution, not more than 3 c.c. of the solution should be required; 1 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution is equivalent to 0·00526 gramme of Sodium Carbonate. The *U.S.P.* has a somewhat similar limit of alkalinity, but determines it by dissolving 5 grammes of the Soap in 50 c.c. of hot Water, and requires that when this solution is mixed with 3 c.c. of Tenth-normal Volumetric Oxalic Acid Solution the subsequent addition of a few drops of Phenolphthalein Solution should produce no pink or red tint. The alkali in combination of the fatty acids in the form of Soap may be determined as described under Sapo Animalis, by titrating the hot Alcoholic Solution used for the determination of the free alkali Hydroxide, with Tenth-normal Volumetric Sulphuric Acid Solution. The *U.S.P.* weighs the undissolved Sodium Carbonate from 20 grammes of Soap dissolved in Alcohol (94·9 p.c.), which should weigh not more than 0·8 gramme. Neither the *B.P.* nor the *U.S.P.* refers to the characters of the fatty acids obtained when an aqueous solution of the Soap is acidified with Diluted Sulphuric Acid. The liberated fatty acids filtered through a paper previously moistened with Water, washed till free from mineral acid and dried, should possess a m.p. of about 26° C. (78·8° F.), an Iodine absorption of about 80 p.c. and a combining weight of about 279·5.

The more generally occurring impurities are free alkali Hydroxide, excess of alkali Carbonate, animal fats, and fatty acids from Oils other than Olive, Silica and other accidental impurities, unsaponified oil, Potassium soap and excess of moisture. Free alkali Hydroxide or excess of alkali Carbonate may be detected by the behaviour of the solution towards Phenolphthalein Solution and by the figure yielded on titrating the hot aqueous solution of the residue remaining after the filtration of the alcoholic solution as referred to at the commencement of the article. Animal fats may be determined by the gelatinisation on cooling of the 25 p.c. solution of the Soap in Alcohol (94·9 p.c.); fatty acids from Oils other than Olive may be detected by determinations of the m.p., Iodine absorption, and combining weight of the separated fatty acids. Metallic impurities may be detected by the Ammonium Sulphide and Hydrogen Sulphide test on the 1–20 Soap solution. Silica and other accidental impurities may be detected by a residue insoluble in Alcohol (94·9 p.c.) and in Water. Unsaponified oil leaves a greasy stain when the Soap is rubbed on white unglazed paper. Potassium Soap yields a deliquescent ash when the specimen is ignited with free access of air. The *B.P.* requires that the Soap shall lose, when dried at a temperature of 110° C. (230° F.), about 30 p.c. of moisture. In determining the amount of moisture the *U.S.P.* places 0·5 of a gramme of Soap with 10 c.c. of Alcohol in a tared beaker containing 1 gramme of clean dry sand, and evaporates to dryness; drying the residue at 110° C. (230° F.) until of a constant weight. The *U.S.P.* requires that the loss should not exceed 36 p.c.

Preparations.

EMPLASTRUM SAPONIS. SOAP PLASTER.

Hard Soap, 6; Lead Plaster, 36; Resin, 1. Melt each ingredient separately at a low temperature; mix; evaporate, with constant stirring, to a proper consistence. (1 of Soap in 7⅙)

Now made with Hard Soap instead of Curd Soap.

Emplastrum Saponis—U.S., 1 in 10; Emplastrum Saponatum—Austr., about 1 in 14; Dan., 1 in 11; Dutch 1 in 10; Ger. and Jap., about 1 in 17; Hung., about 1 in 15½; Norw., about 1 in 17; Russ., 1 in 17½; Swiss, 1 in 10; Emplastrum Saponaceum—Swed., 1 in 9; Emplasto de Jabon—Mex., 1 in 18; Emplastro de Sabao—Port., 1 in 12½; Emplasto de Jabon—Span., about 1 in 17; (Saponis Emplastrum Camphoratum) Belg., Lead Plaster 75, Yellow Wax 10, Hard Soap 10, Olei officinalis 3, Camphor 2. Austr. has also Emplastrum Saponatum Salicylatum, Soap Plaster 85, Yellow Wax 5, Salicylic Acid 10.

LINIMENTUM SAPONIS. *See* SAPO MOLLIS.

PILULA SAPONIS COMPOSITA. *See* OPIUM.

Not Official.

LINIMENTUM SAPONIS.—Soap, dried and granulated, 6; Camphor, in small pieces, 4·5; Oil of Rosemary, 1; Alcohol (95 p.c.), 72·5; Water, *q.s.* to make 100.—*U.S.P.*

SPIRITUS SAPONATUS.—Castile Soap, in shavings, 17·5; Alcohol (95 p.c.), 60; Water, *q.s.* to make 100. Dissolve and filter.—*U.S.N.F.*

Spiritus Saponatus of the *P.G.* is made by saponifying Olive Oil 6 with solution of Potassium Hydroxide 7, and adding Alcohol 30, and Water 17, all by weight.

Spiritus Saponatus of the *B.P.C.* is made by dissolving 65 of Soft Soap in sufficient Alcohol (90 p.c.) to produce 100.

EUNATROL (Sodium Oleate).—Under this proprietary title has been introduced a substance containing pure Sodium Oleate. Stated to be useful as a cholagogue. Yellowish-white fatty solid, possessing a faint odour of Oleic Acid. Best prescribed in pills or capsules. Dose, 10 to 15 grains = 0·65 to 1 gramme, twice daily.—*P.J.* '02, i. 6.

SAPO MOLLIS.

SOFT SOAP.

A yellowish-white, or yellowish-green, unctuous semi-solid.

The *B.P.* Soft Soap is prepared with Potassium Hydroxide and Olive Oil. The *U.S.P.* and the *P.G.* with Potassium Hydroxide, and Linseed Oil.

Solubility.—1 in 4 of Water; 1 in 1 of boiling Water; almost entirely 1 in 1 of Alcohol (90 p.c.).

Official Preparation.—Linimentum Saponis. Contained in Linimentum Terebinthinæ. **Soap Liniment** is contained in Linimentum Opii.

Not Official.—Sapo Kalinus Venalis, Solutio Saponis Ætherea, Spiritus Saponis Kalini, Mollin.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch and Jap. (Sapo Kalinus); Fr. (Savon Noir); Ger., Hung., Russ., Swed. and Swiss (Sapo Kalinus and Sapo Kalinus Venalis); Ital. (Sapone di Potassa); U.S. (Sapo Mollis); Dutch has also Sapo Superadipatus, Wool Fat 4, Soft Soap 20, Hard Soap 76. Jap. and Swiss have also Sapo Veridis.

Tests.—Soft Soap dissolves in cold Alcohol (90 p.c.), and readily in hot Alcohol (90 p.c.). It is officially required to yield no free alkali Hydroxide as determined by digesting 5 grammes in boiling Alcohol (90 p.c.), filtering and adding a few drops of Phenolphthalein Solution to the filtrate, which should not afford a red or a pink coloration. The *U.S.P.* does not differentiate between the free alkali Hydroxide or the Carbonated alkali, but requires it to conform to the tests given below under the heading of Tenth-normal Volumetric Oxalic Acid Solution. The *P.G.* requires that a solution of 10 grammes of Soap in 30 c.c. of Alcohol (90 p.c.) shall remain clear after the addition of 0·5 c.c. of Normal Volumetric Hydrochloric Acid Solution, and on the further addition of 1 drop of Phenolphthalein Solution shall not assume a red coloration. The *B.P* fixes the limit of alkali Carbonate at 0·41 p.c. as determined by titrating the solution in hot Water of the residue insoluble in boiling Alcohol (90 p.c.). The use of Phenolphthalein Solution as an indicator of neutrality is recommended, but Methyl Orange Solution is more suited to the purpose, for the reason stated under Sapo Durus. Neither the *U.S.P.* nor the *P.G.* includes a volumetric test for limit of alkali Carbonate. The *B.P.* fixes the limit of Potassium Carbonate, insoluble Soaps, etc., as determined by the weight of residue insoluble in hot Alcohol (90 p.c.), at 3 p.c.; the *U.S.P.* allows a similar limit for the amount of residue insoluble in hot Alcohol (94·9 p.c.). No official mention is made as to the characters of the fatty acids, and consequently no confirmation is afforded that the particular Oil recommended in the official method of preparation has been employed in the manufacture of the Soap. To ascertain these characters the Soap is dissolved in Water, the aqueous solution acidified with Hydrochloric Acid, and the liberated fatty acids filtered through a filter paper previously moistened with Water, washed till free from mineral acid and carefully dried. They should possess a m.p. of about 26° C. (78·8° F.), an Iodine absorption of about 85 p.c., and a combining weight of 275 to 285. The *U.S.P.* does not include any methods for the examination of the fatty acids. The *P.G.* states that the fatty acid content of Sapo Kalinus Venalis amounts to at least 40 p.c. as determined by the process given in small type below. It has been recommended that a limit of Water should be added. The Soap may contain unsaponified oil or may be coloured with Copper salts, or be prepared by the saponification of Oils other than Olive. When rubbed on a piece of white glazed paper it should not impart an oily stain. When incinerated with free access of air it should yield an ash of a very deliquescent nature, which, when dissolved in diluted Hydrochloric Acid and tested with Hydrogen Sulphide, should not afford a brown coloration or precipitate, and which should impart a violet colour to a non-luminous flame. The presence of Oils other than Olive may be detected by the determination of the m.p., the Iodine absorption, and combining weight of the fatty acids, obtained as above.

Alcohol.—If 1 volume of a cooled solution of 5 grammes of Sapo Kalinus Venalis in 10 c.c. of hot Water be mixed with 1 volume of Alcohol, the mixture should remain clear, and even after the addition of 2 drops of Hydrochloric Acid a flocculent precipitate should not separate, *P.G.*

Tenth-normal Volumetric Oxalic Acid Solution.—A solution of 5 grammes of Soft Soap in 50 c.c. of Water with 2 drops of Phenolphthalein T.S. added should require not less than 2·3 c.c. nor more than 4·5 c.c. of Tenth-normal Oxalic Acid Volumetric Solution to discharge the red tint, *U.S.P.*

Determination of the Fatty Acids.—Dissolve 5 grammes of Soft Soap in 100 c.c. of hot Water. Mix the solution with 10 c.c. of diluted Sulphuric Acid in a test-glass and warm the mixture on a water-bath until the separated fatty acid forms a clear layer on the top of the aqueous fluid. Add 50 c.c. of Petroleum Benzin to the cooled liquid, stopper the test-glass and shake until solution of the fatty acid takes place, then allow 25 c.c. of this solution to evaporate at a gentle heat in a beaker and dry the residue until it is of constant weight at a temperature not exceeding 75° C. (167° F.). The residue should weigh at least 1 gramme, *P.G.*

Preparation.

LINIMENTUM SAPONIS. Liniment of Soap.

Soft Soap, 2 oz.; Camphor, 1 oz.; Oil of Rosemary, 3 fl. drm.; Alcohol (90 p.c.), 16 fl. oz.; Distilled Water, 4 fl. oz. Dissolve the Soap in the Water, and mix it with the Camphor and Rosemary dissolved in the Alcohol; after a week, filter.

Tests.—Soap Liniment has a sp. gr. of 0·895 to 0·900; it contains about 6 p.c. w/v of total solids and about 60 p.c. w/v of Absolute Alcohol.

Linimentum Saponis.—

U.S., Soap 60, Camphor 45, Oil of Rosemary 10, Alcohol 725, Water, *q.s.* to make 1000.

Linimentum Saponis Mollis.—U.S., Soft Soap 650, Oil of Lavender 20, Alcohol to make 1000.

Linimentum Saponis Rubefaciens.—Russ., Cantharides 1, Oil of Turpentine 20, Spanish Soap 24, Saponis Sebacei 16, Camphor 8, Alcohol (70 p.c.) 240, Solution of Caustic Ammonia 12.

Linimentum Saponis Camphoratum.—Swed., Linseed Oil 10, Solution of Caustic Potash 7, Camphor 5, Oil of Rosemary 1, Distilled Water 27, Alcohol (90 p.c.) *q.s.*

Linimentum Saponato-Camphoratum.—

Austr., Stearin 22, Solution of Caustic Soda 22, Glycerin 20, Alcohol (90 p.c.) 90; saponify and mix with it Camphor 20, Alcohol (90 p.c.) 790; add Ammonia 26, Lavender Oil ·5, Oil of Rosemary 5.

Ger. and Jap., Sapo Medicatus 40, Camphor 10, Alcohol (90 p.c.) 420, Oil of Thyme 2, Oil of Rosemary 3, Liquid Ammonia 25.

Hung., Saponis Albissimi 120, Alcohol (70 p.c.) 500, Camphor 10, Oil of Lavender 5, Oil of Rosemary 5, Liquid Ammonia 20.

Linimentum Saponato-Camphoratum Liquidum.—Russ., Spirit of Soap 175, Spirit of Camphor 60, Solution of Caustic Ammonia 12, Oil of Thyme 1, Oil of Rosemary 2.

Linimento di Sapone con Canfora.—Ital., Curd Soap 10, Alcohol (90 p.c.) 125, Camphor 10, Oil of Rosemary 5, Liquid Ammonia 5.

Linimentum Opodeldoc.—

Norw., Saponis Butyracei 8, Camphor 2, Alcohol (90 p.c.) 84, Liquid Ammonia 4, Oil of Rosemary 1, Oil of Thyme 1.

Swed., Lard 10, Solution of Caustic Soda 6, Camphor 5, Oil of Rosemary 2, Oil of Thyme 1, Liquid Ammonia 10.

Balsamo Opodeldoch Liquido.—Span., Soda Soap 10, Camphor 9, Oil of Rosemary 2, Oil of Thyme 1, Liquid Ammonia 4, Alcohol (80 p.c.) 100.

Balsamo Opodeldoch Solido.—Span., Curd Soap 12, Camphor 10, Liquid Ammonia 4, Oil of Rosemary 2, Oil of Thyme 1, Alcohol (90 p.c.) 100.

Balsamum de Opodeldoc Concreto.—Mex., Sapo Animalis 30, Camphor 24, Liquid Ammonia 10, Oil of Rosemary 6, Oil of Thyme 2, Alcohol (90 p.c.) 250.

Baume Opodeldoch.—Fr., Sapo Animalis 19, Camphor 15, Alcohol (90 p.c.) 155, Liquid Ammonia 6, Oil of Rosemary 4, Oil of Thyme 1.

Opodeldoc.—

Dan., Saponis Medicati 80, Camphor 20, Alcohol (90 p.c.) 840, Oil of Thyme 4, Oil of Rosemary 6, Liquid Ammonia 50.

Port., Sapo Animalis 16, Camphor 16, Liquid Ammonia 8, Lavender Oil 1, Oil of Rosemary 1, Alcohol (85 p.c.) 158.

Swiss., Lard 10, Alcohol (90 p.c.) 5, Solution of Caustic Soda 5; saponify and add Alcohol (90 p.c.) 162, Camphor 5, Oil of Rosemary 2, Oil of Thyme 1, Liquid Ammonia 10.

Opodeldoc Liquidum.—

Swiss, Spirit of Soap 136, Spirit of Camphor 48, Liquid Ammonia 13, Oil of Rosemary 2, Oil of Thyme 1.

Spiritus Saponis.—

Austr., Olive Oil 100, Caustic Potash 60, Alcohol (90 p.c.) 100, Alcohol (68 p.c.) 738, Lavender Oil 2.

Belg., Saponis Officinalis 200, Alcohol (60 p.c.) 795, Lavender Oil 5.

Swiss, Olive Oil 100, Solution of Caustic Potash 52, Alcohol (90 p.c.) 500, Water 348.

Spiritus Saponatus.—

Dutch, Solution of Caustic Potash 75, Oil of Sesame 195, Alcohol (90 p.c.) 350, Water 378, Oil of Lavender 2.

Ger. and Jap., Olive Oil 6, Solution of Caustic Potash 7, Alcohol (90 p.c.) 30, Water 17.

Spiritus Saponato-Camphoratum.—

Dan., Caustic Potash 4, Distilled Water 67, Olive Oil 20, Alcohol (90 p.c.) 100, Camphor 5, Oil of Rosemary 2, Oil of Thyme 2.

Ger., Spirit of Camphor 60, Spirit of Soap 175, Liquid Ammonia 12, Oil of Thyme 1, Oil of Rosemary 2.

Tintura de Jabon Alcanforado.—Mex., Soap 12, Alcohol (80 p.c.) 400, Camphor 12, Oil of Rosemary 3, Oil of Thyme 3, Liquid Ammonia 12.

Not Official.

SAPO KALINUS VENALIS (*Ger.*).—A yellowish-brown, or greenish, translucent soap, prepared from Linseed Oil with Potash. For use in skin diseases.

SOLUTIO SAPONIS ÆTHEREA. *Syn.* ETHER SOAP.—Oleic Acid, 7 fl. oz.; Alcohol (90 p.c.), 3 fl. oz. Mix and neutralise with about 1½ fl. oz. saturated solution of Potassium Hydroxide (1 in 1 of Water); when cool add Oil of Lavender, 20 minims; Methylated Ether, sp. gr. 0·720, to 20 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

SPIRITUS SAPONIS KALINI (*Hebra*).—Soft Soap, 24; Alcohol (90 p.c.), 12; Spirit of Lavender, 1.

Potash Soap, 65; Spirit of Lavender, 3; Alcohol, *q.s.* to produce 100.—*B.P.C.*

Linseed Oil, 35; Solution of Caustic Potash, 20; Alcohol (68 p.c.) 44, Oil of Lavender, 1.—*Austr.*

MOLLIN.—A Soft Soap, containing 17 p.c. of uncombined fat and 30 p.c. of Glycerin.

It has been recommended as a basis for ointments.

Not Official.

SAPPAN.

The Heart-wood of *Cæsalpinia Sappan*, L., and a **Decoctum Sappan** (1 in 20), dose, ½ to 2 fl. oz. = 14·2 to 56·8 c.c., are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

SARSÆ RADIX.

SARSAPARILLA.

FR., SALSEPAREILLE DU MEXIQUE; GER., SARSEPARILLE; ITAL., SALSAPARIGLIA; SPAN., ZARZAPARRILLA.

The dried Root of *Smilax ornata*, Hook. f.

Several commercial varieties of the drug are known. The British Pharmacopœia have made the 'Jamaica Sarsaparilla,' imported from Costa Rica, official. The U.S. use *Smilax officinalis*, H. B. and K., *S. medica*, Schl. and Cham., *S. papyracea*, Duham., and other undetermined species of *Smilax*.

Medicinal Properties.—Alterative and tonic; opinions differ as to its efficacy. The Compound Decoction is given in secondary syphilis, chronic rheumatism and skin diseases, but generally in combination with other remedies such as Potassium Iodide.

Interest in this drug was revived by a lecture on some unusual manifestations of syphilis in the upper air passages (*B.M.J.* '06, i. 61), in the treatment of which a decoction of this root was recommended, 7 oz. of the stronger Zittmann's decoction being taken daily in the morning, and 7 oz. of the weaker decoction in the evening. The treatment was followed for 10 days by Kobert's decoction, and finally the two Zittmann's decoctions for another fortnight. Under the treatment the general health improved from day to day, the ulcers cicatrised in the most desirable manner, and ultimately were replaced by a solid scar.

Considerable discussion (*B.M.J.* '06, i. 359, 710, 770, 791, 889, 960, 1075) followed the appearance of this paper, and a reference is made to the English preparations and uses of Sarsaparilla.—*B.M.J.* '06, i. 710.

Incompatibles.—Alkalis; they accelerate its decomposition.

Official Preparations.—Extractum Sarsæ Liquidum, Liquor Sarsæ Compositus Concentratus.

Not Official.—Decoctum Sarsæ Compositum, Decoctum Zittmanni Fortius, Decoctum Zittmanni Mitius, Kobert's Decoction, Decoctum Sarsaparillæ Compositum, Syrupus Sarsaparillæ Compositus, and Tisane de Salsepareille.

Foreign Pharmacopœias.—Official in all.

Descriptive Notes.—There are several kinds of Sarsaparilla in commerce, the principal varieties being respectively known as Red Jamaica, Orange or native Jamaica, Lima, Honduras, Mexican and Guayaquil. The Red Jamaica kind is imported from Costa Rica and occurs in oblong bundles about $1\frac{1}{2}$ feet (45 cm.) long and 5 to 6 in. (12 to 15 cm.) in diameter, wrapped round with a few long roots. The roots are about $\frac{1}{8}$ in. (3 mm.) in diameter, usually furnished with many small rootlets, have a reddish-brown bark, and are longitudinally furrowed and wrinkled. This Sarsaparilla is usually preferred, as it gives more extract than the other kinds, but the Honduras kind, which is official in the *P.G.* and the *U.S.P.*, is more acrid, and has a mucilaginous taste. It is a brownish-grey, and the roots are about $\frac{1}{6}$ in. (4 mm.) thick. The bundles are cylindrical, about 24 in. (60 cm.) long and $3\frac{1}{2}$ in. (9 cm.) in diameter, or 27 in. (70 cm.) long and $2\frac{1}{2}$ in. (6 cm.) broad, closely wrapped round with a coil of the root. It is usually more starchy than the Jamaica kind. Native Jamaica Sarsaparilla is grown in that island, and is imported in limited quantity; it is chiefly consumed in the North of England. It is of a bright brown colour, plumper, $\frac{1}{6}$ in. (4 mm.) in diameter, and less shrivelled than the Red Jamaica kind.

Lima Sarsaparilla resembles the Red Jamaica kind, but is rather paler and occurs in cylindrical bundles about $2\frac{1}{2}$ in. (6 cm.) in diameter and 21 in. (50 cm.) long, with a few roots coiled round them, the rootlets being about $\frac{1}{8}$ in. (3 mm.) in diameter. Guayaquil Sarsaparilla occurs in loose bundles about 24 in. (60 cm.) long and 4 to 5 in. (10 to 12 cm.) wide, the roots being attached to the chump or rootstock; the roots are browner and coarser than the Jamaica kind, up to $\frac{1}{6}$ or $\frac{1}{5}$ in. (4 or 5 mm.) and less fibrous. The Mexican or Vera Cruz kind also is not packed in bundles, it contains the rootstock but the roots are slender, $\frac{1}{12}$ to $\frac{1}{10}$ in. (2 to 2·5 mm.) in diameter, and about 2 feet long, nearly straight and with few rootlets.

It is stated that the different kinds of Sarsaparilla can be distinguished in section by the character of the endodermis cells, but Vogl, *Pharmacognosie*, pp. 313–315 (and others), represent the cells of the Honduras Sarsaparilla as square and equally thickened, and those of Red Jamaica Sarsaparilla as radially rectangular and unequally thickened. The *B.P.* statement concerning the Jamaica Sarsaparilla, that the cells of the endodermis are uniformly thickened and nearly square in transverse section, has apparently been drawn from the Honduras variety.

The roots contain acicular crystals of Calcium Oxalate, and numerous starch grains, which are most abundant in the part farthest from the rhizome.

It may be noted that the *U.S.P.* attributes Honduras Sarsaparilla to *S. officinalis*, Kunth., and also makes official, *S. medica*, Cham. and Schlecht. (Mexican ?), *S. papyracea*, Duham. (Para ? Guatemala ?), *S. ornata*, Hook. f. (Jamaica ?); but it does not state the commercial equivalents of these species, and it is difficult to learn even from the 18th Ed. of the *National Dispensatory* which commercial varieties are intended. For illustrations of the different commercial kinds *see Pereira Mat. Med.*, vol. ii. fol. i. pp. 274–284 (4th Ed.).

Tests.—Sarsaparilla Root yields from 5 to 7 p.c. of ash.

Preparations.

EXTRACTUM SARSÆ LIQUIDUM. Liquid Extract of Sarsaparilla.

A Liquor obtained by repercolation of Sarsaparilla with Alcohol (20 p.c.), until 18 represents 20 of Root, then 2 of Glycerin is added. (1 root in 1)

Now made by repercolation with diluted Alcohol as suggested in the *Companion*, and Glycerin is used in place of Sugar.

Dose.—2 to 4 fl. drm. = 7·1 to 14·2 c.c.

Foreign Pharmacopœias.—Official in Belg., Fr., Mex. and U.S., 1 in 1. Fr., Ital., Mex., Port. and Span. have a **solid extract**,

Fluidextractum Sarsaparillæ Compositum.—Moisten Sarsaparilla in No. 30 powder 75, Glycyrrhiza in No. 30 powder 12, Sassafras in No. 30 powder 10, Mezereum in No. 30 powder 3, with 10 of Glycerin mixed with 90 of Alcohol (49 p.c.); percolate with Alcohol (49 p.c.). Reserve the first 80 parts and evaporate the remainder to a soft extract, which dissolve in reserved portion, and make up to 100 c.c.—*U.S.P.*

Tests.—Liquid Extract of Sarsaparilla has a sp. gr. of 1·050 to 1·090; it contains about 28 p.c. w/v of total solids and about 19 p.c. w/v of Absolute Alcohol.

LIQUOR SARSÆ COMPOSITUS CONCENTRATUS. Concentrated Compound Solution of Sarsaparilla.

Sarsaparilla, cut transversely and bruised, 20; Sassafras Root, in shavings, 2; Guaiacum Wood, in shavings, 2; Dried Liquorice Root, bruised, 2; Mezereon Bark, cut small, 1; Alcohol (90 p.c.), 4½. Infuse the Sarsaparilla in 3 successive portions of 100 of Distilled Water, for 1 hour each, at 160° F. (71·1° C.). Boil the other solid ingredients with Distilled Water until exhausted. Rapidly concentrate the mixed infusion and decoction until, when cold, the liquid measures 16; add the Alcohol; set aside for at least 14 days; filter. The product should measure 20. (1 in 1)

Dose.—2 to 8 fl. drm. = 7·1 to 28·4 c.c.

This formula is practically the same as that which has been given in previous editions of the *Companion*, under the heading, 'Extractum Sarsæ Liquidum Compositum'; the ingredients are similar to those of Decoctum Sarsæ Compositum, *B.P.* '85.

Tests.—Concentrated Compound Solution of Sarsaparilla has a sp. gr. of 1·020 to 1·040; it contains from 10 to 15 p.c. w/v of total solids and about 20 p.c. w/v of Absolute Alcohol.

Not Official.

DECOCTUM SARSÆ COMPOSITUM.—Jamaica Sarsaparilla, cut transversely, 2½; Sassafras Root, in chips, ¼; Guaiacum Wood turnings, ¼; Dried Liquorice Root, bruised, ¼; Mezereon Bark, ⅛; Boiling Distilled Water, 30. Digest the solid ingredients in the Water for an hour, boil for 10 minutes, cool, strain and make up to 20 fl. oz.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

DECOCTUM ZITTMANNI FORTIUS. Zittmann's Decoction (Strong).—Sarsaparilla Root, 100; Water, 2600; Powdered Sugar, 6; Powdered Alum, 6; Mild Mercurous Chloride, 4; Red Mercuric Sulphide, 1; Anise Fruit, crushed, 4; Fennel Fruit, crushed, 4; Senna Leaves, cut, 24; Liquorice Root, cut, 12. The Sarsaparilla Root is digested for 24 hours with the Water, the powdered Sugar, powdered Alum, Mild Mercurous Chloride and Red Mercuric Sulphide are then added, the mixture heated in a covered vessel in a steam-bath for 3 hours, stirring frequently; the Anise Fruit, Fennel Fruit, Senna Leaves and the Liquorice Root are added towards the end of the boiling; the liquid strained by expression and set aside for a short time. Decant 2500 parts of the clear liquid.

DECOCTUM ZITTMANNI MITIUS. Zittmann's Decoction (Weak).—The residue from the stronger decoction, and Sarsaparilla Root, cut, 50; Water, 2600; Lemon Peel, cut and bruised, 3; Cassia Bark, crushed, 3; small Cardamom Seeds, bruised, 3; Liquorice Root, cut and bruised, 3. The residue of the stronger decoction and the Sarsaparilla Root are extracted with Water by heating in a steam-bath for 3 hours in a covered vessel, stirring frequently; the Lemon Peel, Cassia Bark, small Cardamoms and Liquorice Root are added towards the end of the operation; the liquid is strained by expression and set aside for a short time. Decant 2500 of the clear liquid.

KOBERT'S DECOCTION.—Sarsaparilla Root, in coarse powder, 1000; Water, *q.s.* Place the Sarsaparilla Root in a closed vessel with 4000 of Distilled Water, and set aside for 3 hours, occasionally stirring; heat and keep boiling for 1 hour, then press out. Repeat this once. Evaporate the combined decoctions until there remains 1 litre (quart), mix well with an equal volume of Alcohol (90 p.c.), wash out the residue with boiling Alcohol (90 p.c.) ½ litre, strain through flannel and filter, evaporate to ⅓ litre or less; establish the quantity of Parillin and Sarsasaponin according to the method of V. Schulz-Christophson, and adjust the strength of the finished product either by evaporating or by adding Distilled Water, so that it shall contain 2 p.c. of the above Glucosides.

DECOCTUM SARSAPARILLÆ COMPOSITUM.—Mix Sarsaparilla 20 with Water 520, and let the mixture stand for 24 hours at a temperature of 35° to 40° C.; after the addition of Sugar 1, Potash Alum 1, heat in a covered vessel, stirring frequently, for 3 hours in a water-bath. Add Anise 1, Fennel 1, Senna 5, Glycyrrhiza 2, leave in the water-bath for a quarter of an hour and separate the liquid by pressing. After the pouring-off bring the weight of the decoction to 500 by the addition of Water.—*Ger.*

TISANE DE SALSEPAREILLE.—Macerate 50 grammes of Sarsaparilla (split and cut) in a little more than 1000 c.c. of Water for 2 hours, place it on the fire, and, as soon as it commences to boil, take it off again and let it digest for two hours; allow it to deposit and decant so as to obtain 1000 c.c. of Tisane. —*Fr.*

SYRUPUS SARSAPARILLÆ COMPOSITUS.—Fluid Extract of Sarsaparilla 2000, Fluid Extract of Glycyrrhiza 150, Fluid Extract of Senna 150, Sugar 6500, Oil of Sassafras 2, Oil of Anise 2, Oil of Gaultheria 2, Water *q.s.* to make 10,000.—*U.S.*

Fluid Extract of Sarsaparilla 15, Fluid Extract of Glycyrrhiza 1, Fluid Extract of Senna 3, Spirit of Anise 1, Simple Syrup 80.—*Belg.*

Percolate Sarsaparilla 100, Guaiacum Wood 20, Senna Leaves 15, Sassafras 5, Anise 10, with a mixture of Alcohol (90 p.c.) and Water (equal weights) until 600 is obtained; to 300 add 50 of Glycerin, filter and continue the evaporation to 100; to each 10 of this extract add 90 of Syrup.—*Swiss.*

SIROP DE SALSEPAREILLE COMPOSÉ.—Pour on to 1000 of Sarsaparilla (split and cut) sufficient Water at 80° C. to cover it, digest for 6 hours and separate the liquid; make a second digestion in a similar manner and add the liquid to that of the first; also a third, which you put aside; heat this to ebullition and throw in 60 of dried Borage flowers, 60 of dried petals of Roses, 60 of Senna leaves, and 60 of Anise fruits, allow to infuse for 6 hours and press; evaporate the first liquors, and when they are reduced to 500 grammes add the third liquid and continue the evaporation until the product weighs 2000 grammes, clarify with white of egg and strain through a cloth; add to the liquid thus obtained 1000 of Sugar and 1000 of White Honey, and make a syrup by boiling and clarification until it has a sp. gr. of 1·29.—*Fr.*

SASSAFRAS RADIX.

SASSAFRAS ROOT.

The dried Root of *Sassafras officinale*, T. Nees and Eberm.

It contains a yellowish, or reddish-yellow, volatile Oil **(Oil of Sassafras)**, which is largely distilled in America, and is official in U.S.; the yield is about 2 p.c. The bulk of this Oil consists of **Safrol**, $C_{10}H_{10}O_2$, a compound also extracted from Oil of Camphor. It is much used for scenting soaps.

Medicinal Properties.—Aromatic and carminative. Used as an adjuvant to other medicines.

The oil strongly recommended for pediculi; the brush is dipped in a saucer full of the oil, the whole head well brushed with it, and a close-fitting linen cap put on for 24 hours.—*B.M.J.* '07, ii. 64.

Official Preparation.—Contained in Liquor Sarsæ Compositus Concentratus.

Foreign Pharmacopœias.—Official in Austr., Mex. and Port., the **Root**; Ger., Jap., Span., Swiss and U.S., the **Root-bark.**

Descriptive Notes.—The root met with in commerce is usually offered by the wholesale houses in the form of chips, apparently of large roots, since very little bark is present. The bark is rough, brown, with a whitish external layer, but smooth, with a satiny lustre on the inner surface. It is slightly astringent, and has a Safrol flavour. The chips of wood are greyish, with a yellowish or often with a reddish tinge. In the *U.S.P.* the much more aromatic bark, deprived of the periderm, is official, as well as the pith of the stem (Sassafras Medulla) *see* below.

The bark is characterised by large oil cells, pitted parenchymatous cells, thick-walled bast fibres, and starch grains singly or in groups of 2 to 3 each, with a well-marked hilum. The starch also occurs in the wood and in the medullary rays. The bark contains a dark brown colouring matter soluble in Liquor Potassæ.

Tests.—Sassafras Root yields about 2 p.c. of ash.

SASSAFRAS MEDULLA. Sassafras Pith (*U.S.*).—It abounds in a gummy matter, which forms a mucilage with Water. 60 grains of Pith to 20 fl. oz. is used as a soothing application to the eyes, and as a drink in diarrhœa.

OLIVERI CORTEX. *Syn.* Black Sassafras.—The dried Bark of *Cinnamomum Oliveri* is official in the *Ind.* and *Col. Add.* for the Australian Colonies. Also **Tinctura Oliveri Corticis,** 1 in 10 (Alcohol 60 p.c.); **dose,** 30 to 60 minims = 1·8 to 3·6 c.c.

SCAMMONIÆ RADIX.

SCAMMONY ROOT.

The dried brownish, or yellowish-grey, perennial tapering Root of *Convolvulus Scammonia*, L.

From Syria and Asia Minor.

Official Preparation.—Used in the preparation of Scammoniæ Resina.

Official in Span. and Swiss.

Descriptive Notes.—The root occurs in commerce in stout hard, cylindrical pieces, often spirally twisted, and having a rough, furrowed, greyish-brown bark, and it is often 2 to 3 in. (50 to 75 mm.) in diameter. Internally it is greyish-yellow and fibrous, and in transverse section exhibits irregularly arranged circles of woody bundles. In the cortical region and around these circles dark resin cells are frequent, and the softer tissues are full of a muller-shaped starch, which is characteristic. The root has been scarce during late years, its exportation having been prohibited, and a root known in commerce as 'Mexican Scammony' Root, derived from *Ipomœa Orizabensis*, Leden., has taken its place as a cheap substitute for the manufacture of Scammony Resin, with which its resin appears to agree in chemical characters. It occurs in irregularly oblong segments, evidently derived from a large root, and like Scammony Root has projecting fibres, but differs in its radiate structure. It contains about 15½ to 18½ p.c. of resin against 5½ to 8½ p.c. in true Scammony Root. *See P.J.* (4) xviii. pp. 326, 327.

Tests.—Scammony Root yields about 10 p.c. of ash. It is officially stated to yield a resin possessing the properties of Scammony Resin when treated with Alcohol (90 p.c.), but no indication as to the amount expected to be yielded is given. It yields about 9, if it is of Levantine origin, the average yield being about 8 p.c. As the root is used only for preparing the Resin it is considered that probably no standard need be indicated, consideration should, however, be given to the different varieties of Scammony Resin now being obtained from roots of the so-called Mexican Scammony.

SCAMMONIÆ RESINA.

SCAMMONY RESIN.

Greenish-grey, or brownish-green, translucent, brittle lumps, with more or less sharp edges, and breaking with a shining fracture. It has a peculiar, characteristic odour.

Scammony Resin is official in the *B.P.* and the *U.S.P.*, but not in the *P.G.* It is identical with the Ether-soluble Resin of Jalap.

It is prepared by exhausting Scammony Root with Alcohol (90 p.c.) recovering the greater part of the Alcohol, and pouring the concentrated liquid into Distilled Water, which precipitates the Resin.

Solubility.—It is soluble in almost all proportions of Alcohol (90 p.c.) or Ether; also soluble in Solution of Potassium Hydroxide.

The purified Resin is known in this country as **Scammonin,** *see* p. 705.

Medicinal Properties.—An energetic, hydragogue cathartic. May be used when brisk action is needed, as in cerebral congestion and severe dropsy; but on account of its griping properties it is rarely used alone. In combination it promotes the action of other medicines, whilst its own harshness is mitigated. It acts also as an anthelmintic, to round-worms and tapeworms.

Dose.—3 to 8 grains = 0·2 to 0·52 gramme.

Official Preparations.—Pilula Scammonii Composita and Pulvis Scammonii Compositus. Contained in Extractum Colocynthidis Compositum, Pilula Colocynthidis Composita, and Pilula Colocynthidis et Hyoscyami.

Not Official.—Confectio Scammonii, Mistura Scammonii, Pulvis Scammonii cum Hydrargyro.

Foreign Pharmacopœias.—Official in Belg., Fr., Ital., Mex., Norw. and U.S.

Tests.—Over and above the official description of the Resin the *B.P.* does not give any chemical tests or constants by which Scammony Resin may be distinguished. The Acid, Ester and Saponification values afford a means of distinguishing the Resin. The Acid value should be, according to Kremel, 14·6, the Ester value 171·0 and the Saponification value 185·6. It may be distinguished from Guaiacum Resin by the non-production of a blue coloration when Ferric Chloride T.S. is added to its solution in Absolute Alcohol, and by the non-formation of a blue colour on the addition of Hydrogen Peroxide Solution to its solution in Absolute Alcohol. It may be distinguished from Jalap Resin by the fact that it dissolves almost entirely in Ether. It should yield when incinerated with free access of air not more than 1 p.c. of ash, which is also the limit allowed by the *U.S.P.* The *B.P.* gives no figure for the ash limit. Resin, if present, may be detected by the increase in the Acid value and the decrease in the Ester value.

Preparations.

PILULA SCAMMONII COMPOSITA. COMPOUND SCAMMONY PILL.

Scammony Resin, 1; Jalap Resin, 1; Curd Soap, in powder, 1; Tincture of Ginger, 3; dissolve, and evaporate to pill consistence.

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

PULVIS SCAMMONII COMPOSITUS. Compound Powder of Scammony.

Scammony Resin, 4; Jalap, 3; Ginger, 1. (1 in 2)

Dose.—10 to 20 grains = 0·65 to 1·3 grammes.

Not Official.

CONFECTIO SCAMMONII.—Resin of Scammony, in powder, 6; Ginger, 3; Oil of Caraway, ¼; Oil of Cloves, ⅛; Syrup, 6; Clarified Honey, 3. Rub the powder with the Syrup and Honey, then add the Oils, and mix. **Dose.**—10 to 30 grains.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

MISTURA SCAMMONII.—Scammony, in powder, 6 grains; Milk, 2 fl. oz.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

PULVIS SCAMMONII CUM HYDRARGYRO.—Mercurous Chloride, 1; Scammony Resin, in powder, 4.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

Tabellæ Scammoniæ cum Chocolata official in Belg., about 3 grains in each.

SCAMMONIUM.

SCAMMONY.

Brown, dark grey, or brownish-black, irregular masses, or circular cakes, breaking with a glossy, resinous fracture. It possesses a peculiar, cheese-like odour.

It is officially described as a Gum-resin, obtained by incision from the living Root of *Convolvulus Scammonia*, L., known in commerce as Virgin Scammony.

Chiefly from Smyrna, in Asia Minor.

Solubility.—Almost entirely dissolved in boiling diluted Alcohol.

Medicinal Properties.—Similar to those of Scammony Resin, but Scammony emulsifies with Water, the Resin does not.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Foreign Pharmacopœias.—Official in Fr., Mex., Port., Span. and U.S.

Descriptive Notes.—Scammony Resin is usually imported in boxes containing pieces varying in purity, which are sorted in this country, the purest pieces being sold as Virgin Scammony. The finest pieces are brittle, translucent, have a brownish tint, a resinous fracture, and are more or less covered with a greyish powder; other pieces have a blackish resinous fracture, are less brittle, and sometimes more or less porous, due to fermentation after collection. An inferior kind, adulterated with Flour and Chalk, known as Skilip Scammony, is hard, tough, not easily fractured, and has an opaque, greyish fracture; it contains only about 40 p.c. of Resin. When rubbed with a wetted finger Scammony gives a milky emulsion, which Resin of Scammony does not. Formerly, Aleppo Scammony was purer than that of Smyrna, now the reverse is the case.

Tests.—Scammony is readily friable and forms with Water a greenish emulsion. When treated with Ether at least 70 p.c. of Resin is officially required to be dissolved. In estimating the Resin soluble in Ether it is recommended to use a light Ether, sp. gr. 0·717, and to break up the residue after evaporating the Ether and again heat, in order to avoid error due to the Resin holding down the Ether. It would probably be better to dry the Scammony, extract with Ether and weigh the insoluble residue. The *U.S.P.* requires that not less than 75 p.c. should be soluble in Ether, and this was the standard previously adopted in the *B.P.* 1885. It may be noted that the majority of good commercial samples of the Gum Resin yield a larger percentage of Ether-soluble Resin than the present official limit. The *U.S.P.* adds that the residue remaining after the evaporation of the ethereal solution when dissolved in hot Potassium or Sodium Hydroxide Solution is not reprecipitated on acidification with Diluted Sulphuric Acid. Aleppo Scammonium has an Acid value of 8·2, an Ester value of 172·0 and a Saponification value of 180·2 (Dieterich, *Analysis of Resins, Balsams and Gum Resins*). It is generally heavily adulterated, Resin, Starch, Chalk and other mineral substances being added. Resin, if present, may be detected by the increase in the Acid value and the decrease in the Ester value. A portion of the powdered Gum Resin when boiled with Water and cooled should give no decided blue coloration on the addition of Iodine Solution. The greenish emulsion formed on triturating the powdered Gum Resin with Water should not effervesce on the addition of Diluted Hydrochloric Acid. It should leave when ignited with free access of air not more than 3 p.c. of ash which is the official limit; the *U.S.P.* also places the ash limit at this figure. It may be distinguished from Guaiacum Resin by not affording a blue coloration on the addition of Ferric Chloride T.S. to its alcoholic solution.

SCILLA.

SQUILL.

FR., SCILLE; GER., MEERZWIEBEL; ITAL., SCILLA; SPAN., ESCILA.

The Bulb of *Urginea Scilla*, Steinh., divested of its dry membranous outer scale, cut into slices, and dried.

From the Mediterranean coasts.

Two active principles have been extracted from Squill, **Scillitoxin** (Scillain) and **Scillipicrin**, both of which strongly affect the heart; but their actions are antagonistic.

Under the title of **Urginea**, *syn.* Indian Squill, the younger bulbs of *Urginea Indica*, Kunth., also the younger bulbs of *Scilla Indica*, J. J. Baker, are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Medicinal Properties.—A stimulant expectorant, diuretic and cardiac tonic, acting similarly to Digitalis, but is more irritating to the gastro-intestinal mucous membrane. It increases the secretion of the bronchial mucous membrane and aids the expectoration of mucus. In chronic bronchitis with scanty secretion it is used with other expectorants, such as Ipecacuanha and Ammonia. In acute bronchitis it is too irritating to the bronchial mucous membrane, while in phthisis it may produce dyspepsia. In dropsy, especially if cardiac in origin, it is combined with Blue Pill and Digitalis.

Dose.—1 to 3 grains = 0·065 to 0·2 gramme.

Official Preparations.—Acetum Scillæ, Oxymel Scillæ, Pilula Scillæ Composita, and Tinctura Scillæ. Contained in Pilula Ipecacuanhæ cum Scilla. The **Vinegar** is used in the preparation of Syrupus Scillæ.

Not Official.—Syrupus Scillæ Compositus, Fluidextractum Scillæ, Mistura Scillæ Composita, Mistura Scillæ et Ipecacuanhæ, Linctus Scillæ, Linctus Scillæ Opiatus, Dr. Abercombie's Cough Mixture, Dr. Milner Fothergill's Mixture.

Foreign Pharmacopœias.—Official in all the Foreign Pharmacopœias; Fr. (Scille); Mex. and Span. (Escila). Belg. and Fr. have Extractum Scillæ, and U.S. has Fluidextractum Scillæ.

Descriptive Notes.—The Squill bulbs, which are often 6 in. (15 cm.) in diameter, are offered in commerce in the form of small curved dried strips about 1 to 5 cm. long, and $\frac{3}{8}$ to $\frac{5}{8}$ in. (9 to 15 mm.) broad in the middle, tapering to either end, usually of a yellowish-white colour, tough and slightly flexible, but brittle when quite recently dried. It has no odour, but a disagreeable bitter taste. There are two varieties of the bulb, known respectively as the Red and White Squill. When derived from the Red Squill the strips have a pinkish colour. Occasionally an unusually bitter sample is met with, but the cause of this has not been ascertained. Squills are very hygroscopic, and to keep their medicinal activity unimpaired should be thoroughly dried on arrival, and kept in an air-tight vessel. The powder is best kept in a bottle with a hollow stopper containing quicklime, or it readily cakes into a hard mass. The bulbs are collected in August, and when fresh their handling causes considerable irritation to the skin. Squill is characterised by the presence of long prismatic crystals of Calcium Oxalate, often 1 mm. long, immersed in a mucilage which contracts into a jelly on the addition of Alcohol. Acicular raphides are also present. Large stomata also occur, and small bundles of laticiferous vessels. Starch granules in small quantity are present in elongated cells near the vascular bundles.

Tests.—Squill yields from 2 to 3 p.c. of ash, and 4 p.c. should not be exceeded. Determinations of the ash made in the author's laboratory showed an average of 2·4 p.c. A standard of 20 p.c. has been suggested for the amount of moisture.

Preparations.

ACETUM SCILLÆ. Vinegar of Squill.

2½ of Squill, bruised, macerated with Diluted Acetic Acid, *q.s.* to yield 20. (1 in 8)

It is conveniently filtered through Talc.

Dose.—10 to 30 minims = 0·6 to 1·8 c.c.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Mex. Norw., Port., Swiss and U.S., 1 in 10. All by weight except U.S.

Tests.—Vinegar of Squill has a sp. gr. of 1·035 to 1·040; it contains from 5 to 9 p.c. w/v of total solids and about 4·0 p.c. w/v of absolute Acetic Acid, as determined by titrating a measured quantity (10 c.c.) with Normal Volumetric Sodium Hydroxide Solution; 10 c.c. requiring from 6 to 7 c.c.

Although a standard of 9 p.c. w/v of total solids is sometimes reached, it appears (*C.D.* '02, i. 733, 808) that a fair average is 8 p.c., with 7 to 9 p.c. as the limit, the figures occasionally going outside by a fraction. When prepared strictly in accordance with the *B.P.* directions it contains immediately when made 3·6 to 4·0 p.c. of absolute Acetic Acid. The *German Pharmacopœia* allows for a loss of Acetic Acid in the process, as the menstruum prescribed contains 5·4 p.c. w/w of Acetic Acid, but the titration test of that Pharmacopœia requires 4·8 to 5·1 p.c. w/v of the acid in the finished Vinegar.

A corresponding preparation, **Acetum Urgineæ**, is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

OXYMEL SCILLÆ. Oxymel of Squill.

Squill, bruised, 2½; Acetic Acid, 2½; Distilled Water, 8; Clarified Honey, liquefied, *q.s.* to bring the fluid to sp. gr. 1·320. (about 1 in 15)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

A corresponding preparation, **Oxymel Urgineæ**, is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Foreign Pharmacopœias.—Official in Austr., Extract of Squill 1, Acetic Acid (96 p.c.) 1, Refined Honey 98; Dan. and Norw., Vinegar of Squill 35, Honey to make 100; Dutch, Vinegar of Squill 2, Refined Honey 1, Sugar 1; Ger. Ital., Jap. and Span., Vinegar of Squill, 1 Refined Honey 2; Hung., Refined Honey 320, Extract of Squill 2, Acetic Acid (96 p.c.) 3, Diluted Acetic Acid 4; Port., Mex. and Fr., Vinegar of Squill 1, Honey 4; Swed., Squill 1, Acetic Acid 2, Distilled Water 8, Refined Honey 30; Swiss, Vinegar of Squill 3, Sugar 3, Refined Honey 4. Not in Belg., Russ. or U.S.

Tests.—Oxymel of Squill should have a sp. gr. of about 1·320.

PILULA SCILLÆ COMPOSITA. Compound Squill Pill.

Squill, 1¼; Ginger, 1; Ammoniacum, 1; Hard Soap, 1; Syrup of Glucose (by weight), about 1. (about 1 in 4)

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

A corresponding preparation, **Pilula Urgineæ Composita**, is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

SYRUPUS SCILLÆ. Syrup of Squill.

Vinegar of Squill, 20; Refined Sugar, 38; it should yield 58 by weight. (about 1 of Squill in 18)

Quantity of Sugar reduced from 40 to 38.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Official in U.S., Vinegar of Squill 45, Sugar 80; Water to measure 100.

Syrupus Scillæ Compositus.—Fluid Extract of Squill, 8; Fluid Extract of Senega, 8; Antimony and Potassium Tartrate, 0·2; Purified Talc, 2; Sugar, 75; Water, *q.s.* to make 100. Average Dose.—2 c.c. (30 minims).—*U.S.P.*

A corresponding preparation, **Syrupus Urgineæ**, is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Tests.—Syrup of Squill has a sp. gr. of about 1·345.

TINCTURA SCILLÆ. TINCTURE OF SQUILL.

1 of Squill, bruised, macerated with 5 of Alcohol (60 p.c.).

(1 in 5)

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Foreign Pharmacopœias.—Official in Belg., Fr., Ger., Ital., Jap., Mex., Port., Span. and Swiss, 1 in 5; all by weight; U.S., 1 in 10. Fr. has also Vin de Scille Composé.

A corresponding preparation, **Tinctura Urgineæ**, is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Tests.—Tincture of Squill has a sp. gr. of 0·960 to 0·975; it contains about 12 p.c. w/v of total solids and about 54 p.c. w/v of Absolute Alcohol. A standard of 10 p.c. w/v or more has been suggested for the total solids.

Not Official.

FLUIDEXTRACTUM SCILLÆ.—Squill, in No. 20 powder, 100; Acetic Acid and Water *q.s.* Mix 27·5 of Acetic Acid with 72·5 of Water and macerate the powder in 80 of the mixture for 48 hours, transfer to a percolator and by slow percolation with the same menstruum continue until the product measures 100.—*U.S.P.* Average Dose.—1½ minims (0·1 c.c.).

This is an Acetic Acid extract.

The previous edition *U.S.P.* 1890 was prepared by exhausting 100 of Squill with Alcohol (70 p.c.), reserving the first 75 and evaporating the weaker percolates to an extract, which was dissolved in the reserved portion, and the product made up to 100. The *B.P.C.* have included an Extractum Scillæ Liquidum made in a similar manner to this (*U.S.P.* 1890) with Alcohol (70 p.c.). It has been proposed by Greenish (*P.J.* '07, ii. 99) to make Acetum Scillæ, Oxymel Scillæ, Syrupus Scillæ, with this fluid extract, but in that case the solvent action of the Acetic Acid would be lost. The *U.S.P.* have now discarded this fluid extract for one made with Acetic Acid as given above.

MISTURA SCILLÆ COMPOSITA.—Oxymel of Squill, 40 minims; Compound Tincture of Camphor, 20 minims; Spirit of Nitrous Ether, 20 minims; Water, to 1 fl. oz.—*East London.*

This has been incorporated in the *B.P.C.*

MISTURA SCILLÆ ET IPECACUANHÆ.—Vinegar of Squill, 10 minims; Vinegar of Ipecacuanha, 10 minims; Potassium Citrate, 15 grains; Solution of Ammonium Acetate, 2 fl. drm.; Anise Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

LINCTUS.—Oxymel of Squill, 15 minims; Mucilage of Tragacanth, 15 minims; Glycerin, 15 minims; Emulsion of Chloroform, 3 minims; Syrup, to 1 fl. drm.—*St. Thomas's.*

This has been incorporated in the *B.P.C.* under the title **Linctus Scillæ,** *syn.* Linctus; Simple Linctus.

LINCTUS SCILLÆ OPIATUS.—Compound Tincture of Camphor, Oxymel of Squill, Syrup of Tolu, of each equal parts. **Dose.**—One teaspoonful.—*St. Bartholomew's.*

This has been incorporated in the *B.P.C.* under the title **Linctus Scillæ Compositus** (or Opiatus).

DR. ABERCOMBIE'S COUGH MIXTURE.—Tincture of Opium, 160 minims; Syrup of Squill, 2 fl. oz.; Cinnamon Water, 4 fl. oz.; Water, 4 fl. oz. One tablespoonful for a dose.—*Pharm. Form.*

This has been incorporated in the *B.P.C.* under the title **Mistura Scillæ et Opii,** *syn.* Abercombie's Cough Mixture.

DR. MILNER FOTHERGILL'S MIXTURE.—Syrup of Squill, 1; Dilute Hydrobromic Acid, $\frac{1}{2}$; Spirit of Chloroform, $\frac{1}{2}$; Water, to 8. **Dose.**—$\frac{1}{2}$ oz. 3 times a day, to be sipped slowly.—*Pharm. Form.*

This has been incorporated in the *B.P.C.* under the title **Mistura Scillæ** with the synonym, Fothergill's Cough Mixture, but with Water to 10 instead of to 8.

SCOPARII CACUMINA.

BROOM TOPS.

The fresh and the dried Tops of *Cytisus scoparius*, Link., a woody shrub indigenous to England, and also found throughout the greater part of Europe.

Medicinal Properties.—Diuretic and in large doses cathartic. Employed in dropsical complaints, especially if cardiac, and often prescribed along with Potassium salts and Digitalis; in renal dropsy it is contra-indicated if there be acute nephritis.

Official Preparations.—Infusum Scoparii and Succus Scoparii.

Not Official.—Decoctum Scoparii, Infusum Scoparii Concentratum, Sparteina, Sparteinæ Periodidum, Sparteinæ Sulphas.

Foreign Pharmacopœias.—Official in U.S. (dried tops).

Descriptive Notes.—Both the fresh and dried tops are official, the former for the succus and the latter for the infusion. The wiry dark green stem and branches are 5-angled, hairy on the young twigs (glabrous, *B.P.*), flexible, and $\frac{1}{12}$ to $\frac{1}{8}$ in. (2 to 3 mm.) thick. The branches are set at an acute angle to the stem, and in the upper part have simple and nearly sessile leaves, but in the lower part trifoliate leaves, which are obovate and are furnished with a petiole about their own length. The fresh plant, when bruised, has a characteristic odour, which is lost in drying. It has a faintly bitter taste. The younger parts of the plant are hairy as well as the young leaves, and the young branches are pubescent before the plant flowers, but in the dried drug (probably collected after the fruit is formed) the pubescence of the stem and the hairs of the leaves are not usually visible, and the *B.P.* description evidently applies to the plant collected in summer or early autumn.

Tests.—Broom Tops yield about 3 p.c. of ash.

Preparations.

INFUSUM SCOPARII. Infusion of Broom.

Broom Tops, dried and bruised, 2; boiling Distilled Water, 20; infuse 15 minutes, and then strain. (1 in 10)

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

It takes the place of Decoction of Broom, *B.P.* '85.

SUCCUS SCOPARII. Juice of Broom.

To 3 of Juice from bruised Fresh Broom Tops, add 1 of Alcohol (90 p.c.); after 7 days filter.

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c.

Not Official.

DECOCTUM SCOPARII.—Broom Tops, dried, 1; Distilled Water, *q.s.* to make the final product after boiling for 10 minutes measure 20 fl. oz.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

INFUSUM SCOPARII CONCENTRATUM.—Broom Tops, in No. 20 powder, 80; Alcohol (90 p.c.), 25; Dilute Chloroform Water (1 in 1000), *q.s.* to make 100. Prepare by repercolation. Before the addition of the Alcohol to the reserved portion this should be heated to a temperature of not less than 85° C. and maintained thereat for 5 minutes. Dose.—1 to 2 fl. drm. = 3·6 to 7·1.—*Farr* and *Wright, P.J.* '06, i. 165 and '07, i. 621; *C.D.* '06, i. 252; and *Y.B.P.* 1907, 248.

This appears in the *B.P.C.*

SPARTEINA ($C_{15}H_{26}N_2$, eq. 232·53).—A clear, colourless, oily liquid, heavier than Water, having an odour somewhat resembling Aniline, and an intensely bitter taste. It is a liquid alkaloid, obtained from Broom.

It should be kept in well-stoppered glass bottles of a dark amber tint, and protected as far as possible from exposure to light and air, as it tends to darken in colour and to become thick.

Practically insoluble in Water, soluble in Alcohol, in Ether, and in Chloroform.

Foreign Pharmacopœias.—Official in Mex. and Span.

Tests.—Sparteine boils at about 287° C. (548·6° F.). It dissolves in Alcohol (90 p.c.), the solution being lævogyrate. It possesses a strongly alkaline reaction towards the usual indicators of neutrality. A glass rod moistened with Hydrochloric Acid held over a watch-glass containing a drop of Sparteine evolves white fumes. It unites with acids to form crystallisable salts. On gradually adding a solution containing 3 parts of Iodine dissolved in Ether to an ethereal solution of 1 part of Sparteine, a black precipitate is formed, which when separated, washed with Ether and dissolved in boiling Alcohol crystallises on cooling in beautiful green needles. A solution of Sparteine gives with Cadmium Iodide Solution a white curdy precipitate, with Sodium Phospho-molybdate Solution a white precipitate, redissolving on heating the liquid. Platinum Chloride Solution yields a yellow crystalline precipitate very insoluble in cold Water and Alcohol, but crystallising from Hydrochloric Acid in rhombic prisms. It yields no coloration with Sulphuric or Nitric Acid. It may be quantitatively determined by titration with Normal Volumetric Sulphuric Acid Solution, using Iodeosin Solution as an indicator of neutrality. In a purely aqueous titration 1 c.c. of Normal Volumetric Sulphuric Acid Solution represents 0·11626 gramme of pure Sparteine. In strong alcoholic solution (provided the Water introduced is not sufficient to unduly reduce the alcoholic strength), 1 c.c. of the Normal Acid Solution represents 0·23253 gramme of pure Sparteine. It should leave no weighable residue when heated with free access of air.

SPARTEINÆ PERIODIDUM ($C_{15}H_{26}N_2.2HI.I_3$. eq. 864·03). — Small, bronze-green crystals, or bronze-green amorphous powder. Insoluble in Water, soluble in Alcohol (90 p.c.). Diuretic. Prepared by the author for the late Dr. Mortimer Granville, and forming one of the series of alkaloidal periodides which evolve Iodine slowly, and which were used by him in gout.

Dose.—½ to 4 grains = 0·032 to 0·26 gramme.

Tests.—Sparteine Periodide dissolves in Alcohol (90 p.c.). 1 gramme when dissolved in 10 c.c. of Alcohol (90 p.c.) and titrated with Tenth-normal Volumetric Sodium Thiosulphate Solution requires about 33·0 c.c. to discharge the colour produced on the addition of Starch Mucilage. This indicates about 41·5 p.c. of Iodine. When treated with Sodium Thiosulphate Solution and made alkaline with Ammonia, shaken with Ether and the ethereal solution spontaneously evaporated, the separated alkaloid should answer the tests given under Sparteine. When ignited with free access of air it should leave no weighable residue.

SPARTEINÆ SULPHAS ($C_{15}H_{26}N_2.H_2SO_4.5H_2O$, eq. 419·27).—Colourless, prismatic crystals, or a white, crystalline powder.

The number of molecules of Water of crystallisation varies with the solution from which it is crystallised. The *U.S.P.* states that when recrystallised from a solution in Alcohol (48·9 p.c.) it contains 5 molecules of Water of crystallisation. The salt official in the *Fr. Codex* (1908), as well as that official in the present *U.S.P.*, contains 5 molecules of Water of crystallisation; that official in the 1890 edition of the *U.S.P.* contained 4 molecules of Water of crystallisation.

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from the light.

Soluble 2 in 1 of Water, 1 in 5 of Alcohol (90 p.c.).

Medicinal Properties.—Cardiac tonic and diuretic. Useful in mitral disease. It slows and strengthens the pulse. Its action is more rapid and less persistent than that of Digitalis.—*B.M.J.* '86, i. 1246; '88, i. 363; *L.* '87, ii. 203; *P.J.* (3) xvi. 543; *Pr.* li. 213; as a preliminary to chloroform anæsthesia.—*B.M.J.E.* '94, ii. 48; *T.G.* '95, 40.

Dose.—¼ to 2 grains = 0·016 to 4·13 gramme.

Foreign Pharmacopœias.—Official in Fr., Mex., Span., Swiss and U.S.

Tests.—Sparteine Sulphate when heated to a temperature of 110° C. (230° F.) loses its Water of crystallisation, equivalent to 21·3 p.c. The anhydrous salt melts at 136° to 138° C. (276·8° to 280·4° F.); the *Fr. Codex* gives 145° C. (293° F.). It dissolves readily in Water, forming a clear solution possessing an acid reaction towards blue Litmus paper. When rendered alkaline with Ammonia, shaken with Ether and the ethereal solution evaporated spontaneously, the separated alkaloid answers the tests given under Sparteine. A 5 p.c. aqueous solution affords a yellow precipitate with Potassium Ferrocyanide Solution. A small quantity of the salt mixed in a porcelain capsule with one-third of its weight of Chromic Acid, and gently warmed gives a green coloration and simultaneously emits a distinct odour of Coniine. An aqueous solution of the salt affords with Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. The percentage of Sparteine Sulphate present may be determined by direct titration with Tenth-normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator. The choice of a solvent in performing the process of titration is important, as although Sparteine is di-basic only half the acid is indicated by titration under the above conditions in aqueous solutions, but when Sparteine Sulphate is dissolved in Alcohol (Absolute or 90 p.c.) the full quantity of acid is indicated. When dissolved in Water 1 c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution is equivalent to 0·041927 gramme of crystallised Sparteine Sulphate, but with Absolute Alcohol or Alcohol (90 p.c.) as a solvent, each c.c. of the Tenth-normal volumetric alkali solution corresponds to 0·02096 gramme of the pure crystallised salt. It should be free from readily charred organic impurities, and should not contain Aniline Sulphate, Ammonium salts, or mineral matter. The salt itself and its solution in concentrated Sulphuric Acid should be colourless. It should yield no odour of Isophenylcyanide when 1 dgm. is heated with 5 drops of Chloroform and 1 c.c. of Alcoholic Potassium Hydroxide Solution, indicating the absence of Aniline Sulphate. It should yield no ammoniacal odour when warmed with Potassium Hydroxide Solution, indicating the absence of Ammonium salts, although a piece of red Litmus paper suspended in the mouth of the test-tube will gradually acquire a blue colour. When ignited with free access of air the salt should leave no weighable residue, indicating the absence of mineral impurities.

Hypodermic Lamels, ½ grain of Sparteine Sulphate in each.

Oxysparteina and **Oxysparteinæ Hydrochloridum** and **Sulphas** have been used in medicine, the dose being about the same as that of Sparteina.

Not Official.

SCOPOLA.

The dried Rhizome of *Scopola Carniolica*, Jacq., known also on the Continent as *Scopolia atropoides*, Link.

The dried Rhizome is official in the *U.S.P.*, and is required to yield not less than 0·5 p.c. of mydriatic alkaloids.

It contains Hyoscyamine, Scopolamine (amorphous Hyoscine) and Atroscine (crystalline Hyoscine).

Medicinal Properties.—It has the same properties as Belladonna and Hyoscyamus.

This drug has not 'taken' in British practice, but it is used on an immense scale in America for the preparation of what is termed 'Belladonna' plaster.

Action of Scopolamine Hydrochloride on the eye.—*Pr.* liv. 469; *T.G.* '93, 338, 781; '94, 423, 480, 625, 680; *B.M.J.* '94, ii. 497.

Foreign Pharmacopœias.—Official in Jap. and U.S. Jap. has an **extract** prepared with weak Alcohol; a **plaster,** Extract 1, Resin Plaster 9; a **tincture,** Root 1, Dilute Alcohol 5; and an **ointment,** Extract 1, Lard 9. U.S. has extract and fluid extract (*see* below).

Tests.—10 grammes of the dried Rhizome in No. 60 powder when examined by the *U.S.P.* process for assay of Belladonna Leaves, given under Belladonna Folia, should yield a quantity of mydriatic alkaloids corresponding to not less than 0·5 p.c.

EXTRACT SCOPOLA.—The Extract of Scopola (*U.S.P.*) is prepared by evaporating the Fluid Extract to a pilular consistence in a porcelain dish at a temperature not exceeding 50° C. (122° F.), constantly stirring during the evaporation. It is required to contain 2 p.c. of mydriatic alkaloids, and the *U.S.P.* directs that should the Extract be found to contain more than this percentage sufficient powdered Milk Sugar should be added to reduce it to this standard.

Tests.—The *U.S.P.* method of assay is identical with that described under the *U.S.P.* process for the assay of Extract of Belladonna Leaves described under Belladonna Folia. Inasmuch, however, as 2 grammes of the Scopola Extract are used in the place of 5 grammes of the Extract of Belladonna Leaves, in calculating the result of the volumetric test into terms of mydriatic alkaloids the product must be multiplied by 50 instead of 20. The quantity of alkaloids yielded from the 2 grammes of Extract employed should correspond to 2 p.c.

FLUIDEXTRACTUM SCOPOLA.—The Fluid Extract of Scopola (*U.S.P.*) is prepared by exhausting dried Scopola Rhizome in No. 40 powder with a mixture of 4 volumes of Alcohol (94·9 p.c.) and 1 volume of Water. It is required to contain 0·5 of a gramme of the mydriatic alkaloids from Scopola.

Tests.—The Fluid Extract is assayed by a process identical with that given by the *U.S.P.* for the assay of Fluid Extract of Belladonna Root, and the process is described under Extractum Belladonnæ Liquidum. A measured quantity (10 c.c.) of the Fluid Extract is employed, and it is required to contain an amount of mydriatic alkaloids corresponding to 0·5 p.c. w/v.

Not Official.

SCUTELLARIA.

The Herb of *Scutellaria lateriflora*, L., commonly known as Mad-dog Skullcap. **Official in** U.S.

Scutellarin is a dry, light, greenish-brown powder, not a pure, proximate principle. It may be prepared by precipitating a concentrated tincture with Water.

Has been used in neuralgia, chorea, delirium tremens, and nervous exhaustion from fatigue or over-excitement.

Dose.—1 to 5 grains = 0·065 to 0·32 gramme.

A **fluid extract** (1 in 1) is also prepared, dose, ½ to 1 fl. drm. = 1·8 to 3·6 c.c. U.S. has fluid extract 1 in 1.

SENEGÆ RADIX.

SENEGA ROOT.

FR., POLYGALA DE VIRGINIE; GER., SENEGAWURZEL; ITAL., POLIGALA VIRGINIANA; SPAN., POLIGALA DE VIRGINIA.

The dried Root of *Polygala Senega*, L.

Senega Root contains Saponin, and will therefore emulsify Oils; it also contains Methyl Salicylate.

Medicinal Properties.—A stimulating expectorant. Chiefly used in chronic bronchitis, especially if secretion be scanty, combined with Ammonium Carbonate, Ipecacuanha, and Squill.

Official Preparations.—Infusum Senegæ, Liquor Senegæ Concentratus, and Tinctura Senegæ.

Not Official.—Fluidextractum Senegæ, Infusum Senegæ Concentratum, Syrupus Senegæ.

Foreign Pharmacopœias.—Official in all.

Descriptive Notes.—Typical Senega Root of good quality is yellowish-grey, curved irregularly, keeled on the inner or concave side, wrinkled longitudinally, and furnished with few branches. At the crown it is enlarged and shows traces of the bases of numerous slender stems. The fracture is short, and the horny translucent cortex is free from starch, and has an irregularly one-sided development of liber tissue which forms the keel; the woody centre is white. The taste is sweetish at first, then acrid, and the odour, especially in decoction, recalls that of Oil of Wintergreen (Methyl Salicylate). At intervals the root becomes scarce in commerce, and other varieties are offered, and the root is sometimes adulterated. A large root with a few principal branches at right angles, and with a crown sometimes 1 in. (25 mm.) across, with portions of the aerial stems attached, is known as Northern Senega, and is referred to the var. *latifolia*, T. and G. Another variety, known as Southern Senega, resembles typical Senega, but has less cortex in proportion, and the keel is absent. It is referred to *Polygala Boykini*, Nutt., or to *P. alba*, Nutt. Both of these differ from the official description in the absence of the keel. Occasionally other American medicinal roots have been found mixed with Senega either accidentally or purposely, but the only adulterant that might be confused with it is the rhizome of *Asclepias Vincetoxicum*, L., which closely resembles it in colour, and is apparently mixed with it in Europe. The distinct rhizomatous character of this adulterant at once distinguishes it, and the roots are crowded together and not contorted.

The distinctive features of the root under the microscope are the absence of starch, raphides, sclerenchymatous cells, and bast fibres, the presence of short tracheids, phloem parenchyma with oblique pores, collenchyma and drops of Oil in the parenchyma. The powdered root also readily gives a frothy solution when shaken with Water.

Tests.—Senega Root yields from 2 to 5 p.c. of ash. The Swiss Pharmacopœia employs the detection of the presence of Methyl Salicylate in the ethereal Extract as a test of identity. An ash limit is not considered necessary.

Preparations.

INFUSUM SENEGÆ. INFUSION OF SENEGA.

Senega Root, in No. 10 powder, 1; boiling Distilled Water, 20. Infuse half an hour, and strain. (1 in 20)

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

Official in Belg., 3 of Fluid Extract in 100; Fr., Tisane de Polygala, 1 of Root in 100.

LIQUOR SENEGÆ CONCENTRATUS. CONCENTRATED SOLUTION OF SENEGA.

A fluid extract (1 in 2) made with a mixture of 2 parts of Alcohol (20 p.c.) and 1 part of Alcohol (45 p.c.); by percolation. (1 in 2)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Concentrated Solution of Senega has a sp. gr. of 1·010 to 1·030; it contains from 10 to 20 p.c. w/v of total solids and from 18 to 22 p.c. w/v of Absolute Alcohol.

TINCTURA SENEGÆ. TINCTURE OF SENEGA.

1 of Senega Root, percolated with Alcohol (60 p.c.), to yield 5. (1 in 5)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Belg., 1 and 5, yielding 5 p.c. of dry residue; Mex., 1 in 5. Belg. has Polygalæ Extractum Fluidum, yielding 25 p.c. dry residue; Dan. has Fluid Extract, 1 in 1.

Tests.—Tincture of Senega has a sp. gr. of 0·935 to 0·940; it contains from 3 to 6 p.c. w/v of total solids and about 55 p.c. w/v of Absolute Alcohol.

Not Official.

FLUIDEXTRACTUM SENEGÆ.—100 of Senega Root in No. 40 powder macerated and percolated with a mixture of 60 of Alcohol (95 p.c.), 30 of Water and 3 of Solution of Potassium Hydroxide; continue the percolation with a mixture of Alcohol (95 p.c.) 2, and Water 1, until drug is exhausted; reserve the first 80, evaporate remainder to a soft extract, which dissolve in reserved portion, and make up to 100 with more of the mixture of Alcohol (95 p.c.) and Water.—*U.S.P.*

This has been incorporated in the *B.P.C.*

INFUSUM SENEGÆ CONCENTRATUM.—Senega Root, in No. 20 powder, 40; Strong Solution of Ammonia, 0·5; Oil of Wintergreen, 0·15 Alcohol (90 p.c.), 1; Dilute Chloroform Water (1 in 1000), 3; *q.s.* to make 100. Mix the powder with the Strong Solution of Ammonia and sufficient menstruum to damp it evenly. Complete by repercolation. Dissolve the Oil of Wintergreen in the product. Dose.—½ to 1 fl. drm.—*Farr* and *Wright*, *P.J.* '06, i. 165 and '07, i. 622; *C.D.* '06, i. 252; and *Y.B.P.* 1907, 251.

This appears in the *B.P.C.*

SYRUPUS SENEGÆ (*U.S.*).—Fluid Extract of Senega *U.S.* as above, 20 Syrup, 80.

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Austr., Senega Root 5, Alcohol (90 p.c.) 5, Water *q.s.* to yield 45, Sugar 75; Belg., Fluid Extract 5, Syrup 95;

Dan., Senega Root 4, Water *q.s.* to yield 37, Sugar 63; Dutch, Ger., Jap. and Russ., Senega Root 5, Alcohol (90 p.c.) 5, Water *q.s.* to yield 40, Sugar 60; Fr., Senega Root 1, Boiling Water 15; decant and add to each 10 of liquor 18 of Sugar; Hung., Senega Root 1, Dilute Alcohol 1, Water *q.s.* to yield 10, Sugar 17; Ital., Senega Root 1, Water 12, Sugar 18; Mex., Extract 0·5, Alcohol (60 p.c.) 9·5, Syrup 90; Norw., Senega Root 4, Water *q.s.* to yield 40, Sugar 60; Span., Senega Root 15, Water *q.s.* to yield 360, Sugar 640; Swed., Senega Root 5, Water *q.s.* to yield 37, Sugar 63; Swiss, a Fluid Extract is made by percolating 50 of the root with a mixture of Alcohol (90 p.c.) 1, and Water 5; and after the addition of Ammonium Hydricum Solutum 5, evaporate to 50 and add Glycerin 50. To each 10 of this Fluid Extract add 90 of Syrup.

SENNA.

SENNA.

FR., SÉNÉ; GER., SENNESBLÄTTER; ITAL., SENA; SPAN., SEN DE ESPANA.

The British Pharmacopœia recognises two kinds; **Alexandrian Senna**, the dried Leaflets of *Cassia acutifolia*, Delile, and **East Indian Senna**, the dried Leaflets of *Cassia angustifolia*, Vahl.

When Senna is ordered in an official preparation either of the above may be used.

U.S. has also an Indian and Alexandrian Senna; Ger. an East Indian Senna. The different kinds of Senna, freed from stalks, are of nearly equal medicinal value.

Medicinal Properties.—An efficient purgative in occasional or habitual constipation.

Prescribing Notes.—*As it produces griping and nausea, it is given with aromatics, such as Fennel in Compound Liquorice Powder, and Oil of Coriander in Syrup of Senna. The infusion is a suitable vehicle for Magnesium Sulphate and similar medicines.*

Dose.—10 to 30 grains = 0·65 to 2 grammes.

Official Preparations.—Confectio Sennæ, Infusum Sennæ, Liquor Sennæ Concentratus, Syrupus Sennæ, and Tinctura Sennæ Composita. Contained in Pulvis Glycyrrhizæ Compositus. The **infusion** is used in the preparation of Mistura Sennæ Composita.

Not Official.—Elixir Sennæ, Extractum Sennæ Leguminorum Liquidum, Extractum Sennæ Fructuum Fluidum, Infusum Sennæ Concentratum, Infusum Sennæ Compositum, Lavement Purgatif and Acidum Catharticum.

Foreign Pharmacopœias.—Official in all.

Tests.—Senna contains from 8 to 14 p.c. of ash. Fourteen samples examined in the author's laboratory gave from 10 to 11·5 p.c., with an average of 10·7 p.c. The ash should be almost entirely soluble in Hydrochloric Acid.

SENNA ALEXANDRINA. ALEXANDRIAN SENNA.

The dried Leaflets of *Cassia acutifolia*, Delile.

Descriptive Notes.—Alexandrian Senna arrives in this country in packages containing leaves roughly sorted into 1st and 2nd qualities, and the pods. The leaves are sifted and picked over on arrival in this country, in order to separate inferior leaves, broken twigs, and various impurities, and to grade the leaves into different sizes and qualities. The leaves, or more correctly leaflets, are opaque, of a light yellowish-green tint, varying from ¾ to 1¼ in. (19 to 30 mm.) in length, lanceolate or oval, acute, mucronate, entire, unequal at the base, usually covered with a short fine pubescence, densest on the mid-rib, and the veins are conspicuous, especially on the under surface. The odour is tea-like but characteristic, and the taste mucilaginous, nauseous in a watery infusion. The characteristic feature is that the leaves are widest below the middle.

The leaves were formerly adulterated with Argel leaves, but these are now rarely met with; these are readily distinguished by their equal base and minutely wrinkled surface. Alexandrian Senna leaves, as imported, vary chiefly in size, amount of debris and discoloured leaves present, the sifted and 'elect' Senna being worth about twice, and the hand-picked leaves three to four times, the value of the crude drug as imported. The siftings, or small Senna, free from dust and sand, but containing about one-third of the weight of stalks and debris, are sold at about half the price of the crude drug. Occasionally the leaves of *Cassia obovata*, Collad., are found in Alexandrian Senna, and they are also occasionally imported separately; they are obovate in shape, and therefore easily recognised, but are considered to be less active than those of *C. acutifolia*. The pods of *C. acutifolia* are imported separately; the infusion is said to be milder in odour and flavour and slower in its action than that of the leaves, although equally effective. Powdered Senna is characterised by the 1-celled short hairs, slightly contracted below and tapering above, with thick and minutely papillose walls, by the cluster crystals in the parenchymatous cells, and the seriate single prismatic crystals in the cells near the fibres of the veins, the polygonal epidermal cells and the long palisade cells.

Argel leaves have 3-celled hairs, contain latex cells, and have short palisade cells.

SENNA INDICA. EAST INDIAN SENNA. *B.P.Syn.*—TINNEVELLY SENNA.

The dried Leaflets of *Cassia angustifolia*, Vahl. From plants cultivated in Southern India.

Descriptive Notes.—East Indian Senna leaflets are from 1 to 2 in. (25 to 50 mm.) in length, lanceolate and acute, with the greatest diameter near the middle, and rather less hairy than the Alexandrian kind. But the drug varies much in different samples, and like the Alexandrian needs sifting and sorting on arrival in this country. The different grades vary in size of the leaflets, freedom from discoloured leaflets and stalks and in their colour, the cultivated or Tinnevelly leaflets being usually greener, while those imported from Arabia, and known as Mecca Senna, are smaller, contain more stalks, are of a more faded or greyish-green tint, and often many discoloured leaflets are present.

The official description evidently indicates the better grades of the drug. Under the microscope the powder of the leaflets offers few distinguishing features from that of the Alexandrian kind.

According to Sayre (*P.J.* (4) iii. p. 458) the epidermal cells are smaller and more uniform in size and shape, with sharper angles, the cells of the Alexandrian being 40 μ and those of East Indian Senna 35 μ in diameter, and the hairs are shorter and less curved and less numerous, but the stomata are less round and more elongated or oval than the Alexandrian Senna, although they have also the appearance of two parallel cells near the ostiole, due to the two guard cells being below the epidermis. The pods of East Indian Senna are longer than those of Alexandrian Senna. Those of *C. obovata*, Collad., differ in having short transverse ridges in the centre of the pod.

Preparations.

CONFECTIO SENNÆ. CONFECTION OF SENNA. *N.O.Syn.*—LENITIVE ELECTUARY.

Senna, 7; Coriander Fruit, 3; Figs, 12; Tamarinds, 9; Cassia Pulp, 9; Prunes, 6; Extract of Liquorice, 1; Refined Sugar, 30. The Figs, Prunes, Tamarinds and Cassia Pulp are treated with Distilled Water and pulped through a sieve; when mixed with the other ingredients the yield should be 75, by weight. (1 in 11 nearly)

Dose.—60 to 120 grains = 4 to 8 grammes.

Foreign Pharmacopœias.—Official in all except Belg., Dan., Fr., Mex., Span. and Swed., but differing in composition.

INFUSUM SENNÆ. INFUSION OF SENNA.

Senna, 2 oz.; Ginger, sliced, ⅛ oz. (55 grains); Distilled Water, boiling, 20 fl. oz. Infuse 15 minutes, and strain. (1 in 10)

From 20 fl. oz. of Infusion only about 14 fl. oz. drain out.

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.; as a draught, 2 fl. oz. = 56·8 c.c.

LIQUOR SENNÆ CONCENTRATUS. CONCENTRATED SOLUTION OF SENNA.

20 of Senna, treated by continuous percolation with Distilled Water to yield 16 of fluid, which is heated to 180° F. (82·2° C.) for 5 minutes, and cooled. To this is added a mixture of Alcohol (90 p.c.) 2, and Tincture of Ginger 2½. It should yield 20, by measure. (1 in 1)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Concentrated Solution of Senna has a sp. gr. of 1·020 to 1·080; it contains from 12 to 18 p.c. w/v of total solids and about 18 p.c. w/v of Absolute Alcohol.

MISTURA SENNÆ COMPOSITA. COMPOUND MIXTURE OF SENNA. *B.P.Syn.*—BLACK DRAUGHT.

Magnesium Sulphate, 5; Liquid Extract of Liquorice, 1; Compound Tincture of Cardamoms, 2; Aromatic Spirit of Ammonia, 1; Infusion of Senna, *q.s.* to yield 20. (1 of Magnesium Sulphate in 4)

B.P. 1885 contained Tincture of Senna, less Compound Tincture of Cardamoms, and no Aromatic Spirit of Ammonia.

Dose.—As a draught, 1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Foreign Pharmacopœias.—Infusum Sennæ Compositum:—Dan., Coriander 2, Fructus Vitis viniferæ apyrenæ 5, Senna 10, Manna 25, Potassium Tartrate 3, boiling Water, *q.s.* to yield 720; Dutch, Senna 10, Anise 3, Water, *q.s.* to yield 80, Sodium Potassium Tartrate 10, Glycerin 10; Belg., Fluid Extract of Senna 10, Fluid Extract of Glycyrrhiza 5, Manna 20, Water 65; Ger. and Jap., Senna 50, Boiling Water 450, Sodium Potassium Tartrate 50, Sodium Carbonate 1, Manna 100, Water, *q.s.* to yield 475, Alcohol (90 p.c.) 25; Norw., Senna 10, Coriander 2, Boiling Water, *q.s.* to yield 70, Manna 25, Potassium Tartrate 5; Russ., Senna 10, Boiling Water 60, Sodium Potassium Tartrate 10, Manna 15, Alcohol (90 p.c.) 3; Swed., Senna 10, Manna 20, Sodium Potassium Tartrate 10, Distilled Water, *q.s.* to yield 100; Swiss, Fennel 5, Senna 10, Manna 10, Sodium Tartrate 10, Water, *q.s.* to yield 100; U.S., Senna 6, Manna 12, Magnesium Sulphate 12, Fennel 2, Boiling Water 80, Cold Water, *q.s.* to yield 100; Austr. (Infusum Sennæ cum Manna) Senna 12, Water 100, Manna 15, Magnesium Carbonate 1; Fr. (Apozème Purgatif), Senna 2, Rhubarb 1, Sodium Sulphate 3, Manna 12, Boiling Distilled Water 20; Hung. (Infusum laxativum), Senna 20, Boiling Water 160, Manna 30; Ital. (Infuso di Sena con Manna) Senna 10, Water, *q.s.* to yield 150, Manna 25; Port. (Infuso de Senne Composto) Senna 10, Anise 2, Manna 20, Sodium Potassium Tartrate 10, Boiling Water 100; Span. (Infusion de Mana Laxante) Manna 60, Senna 20, Magnesium Sulphate 9, Water, *q.s.* to yield 300; also Infusion de Mana Purgante, Manna 90, Senna 12, Cinnamon Water 1, Water, *q.s.* to yield 300. Russ. has also Infusum Sennæ Salinum, Senna 10, Boiling Water 100, Sodium Sulphate 10, Refined Honey 10.

Tests.—Compound Mixture of Senna has a sp. gr. of 1·115 to 1·120; it contains about 16 p.c. w/v of total solids and about 12 p.c. w/v of Absolute Alcohol.

SYRUPUS SENNÆ. SYRUP OF SENNA.

50 oz. of Sugar is dissolved with the aid of heat in 40 fl. oz. of a liquid extract of Senna (1 in 1); and when cool 10 minims of Oil of Coriander dissolved in 40 minims of Alcohol (90 p.c.) is added. It should yield 92 oz., by weight. (1 in 1¾)

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c.

Foreign Pharmacopœias.—Syrupus Sennæ:—Dutch, Senna 10, Water, *q.s.* to yield 38, Sugar 62; Ger. and Jap., Senna 10, Fennel 1, moisten them with Alcohol (90 p.c.) 5, pour on them Distilled Water 60, and extract in the cold for 12 hours, strain without pressing, boil the strained liquid, filter, after cooling dissolve in 35 of the filtrate 65 of Sugar; U.S., Fluid Extract of Senna 250, Coriander Oil 5, Syrup, *q.s.* to make 1000. Syrupus Sennæ Compositus:—Austr., Senna 10, Anise 1, Water 100; strain, and to each 10 add Manna 2, Sugar 15; Belg., Fluid Extract of Senna 75, Fluid Extract of Glycyrrhiza 15, Spirit of Anise 10, Syrup 900. Syrupus Sennæ Mannatus:—Dan., Manna 150, Senna 100, Fennel 5, Ginger 5, Distilled Water, *q.s.* to yield 500, Sugar 500; Norw., Fennel 1, Ginger 1, Senna 10, Manna 15, Boiling Water, *q.s.* to yield 50, Sugar 50; Swed., Fennel 1, Senna 10, Manna 15, Distilled Water, *q.s.* to yield 50, Sugar 50. Hung., Syrupus Mannatus, Senna 30, Anise 3, Sodium Carbonate 3, Alcohol (70 p.c.) 30, Water, *q.s.* to yield 300, add Sugar 400, Manna 90. Ital., Sciroppo di Sena e Manna, Senna 15, Anise 2, Water, *q.s.* to yield 130, in which dissolve Manna 60, Sugar 200. Mex., Jarabe de Sen, Extract of Senna 2·5, Water 7·5, Syrup 90. Jap. has also Sirupus Sennæ cum Manna, Senna 35, Fennel 2, pour on them boiling Water 350, set aside for 12 hours; express; in the expressed liquid 350, dissolve Manna 50, Sugar 400, allow to subside; decant the upper clear liquid; evaporate till it attains a syrupy consistence and strain.

Tests.—Syrup of Senna has a sp. gr. of 1·290 to 1·320.

TINCTURA SENNÆ COMPOSITA. Compound Tincture of Senna.

Senna, 4; Raisins of commerce, freed from seeds, 2; Caraway Fruit, ½; Coriander Fruit, ½; Alcohol (45 p.c.), 20; by maceration. (1 in 5)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c., for repeated administration; for a single administration, 2 to 4 fl. drm. = 7·1 to 14·2 c.c.

Foreign Pharmacopœias.—Official in Mex., 1 in 5. Fluid extract official in U.S. 1 in 1; Belg., yelding 20 p.c. dry residue. Belg. and Dan. have an alcoholic extract.

Tests.—Compound Tincture of Senna has a sp. gr. of 0·985 to 0·995; it contains about 10 p.c. w/v of total solids and about 39 p.c. w/v of Absolute Alcohol.

Not Official.

ELIXIR SENNÆ.—16 fl. oz. of a liquor obtained from 16 oz. of Alexandrian Senna by two macerations with a mixture of 4 of Alcohol (90 p.c.) and 12 Distilled Water, is heated with 12 oz. of Sugar to 200° F. (93·3° C.) for 10 minutes. Mix Chloroform, 24 minims; Oil of Coriander, 2½ minims; Tincture of Capsicum, ½ fl. drm., and Alcohol (90 p.c.), 3 fl. drm. Add them to the Syrup, and make up if necessary to 24 fl. oz. with Alcohol (60 p.c.).—*B.P.C. Formulary* 1901, now incorporated in the *B.P.C.* with the synonym Liquor Sennæ Dulcis.

Dose.—1 to 3 fl. drm. = 3·6 to 10·6 c.c.

EXTRACTUM SENNÆ LEGUMINORUM LIQUIDUM.—20 fl. oz. of liquor obtained from 20 oz. of Senna Pods by two macerations with a mixture of 1 of Alcohol (90 p.c.) with 2 of Distilled Water. Heat to 200° F. (93·3° C.) for 10 minutes, and when cold add if necessary more of the mixture to make 20; filter.—*B.P.C. Formulary* 1901, now incorporated in the *B.P.C.* under the title **Extractum Sennæ Liquidum.**

Dose.—1 fl. drm. = 3·6 c.c.

EXTRACTUM SENNÆ FRUCTUUM FLUIDUM.—Exhaust Senna Pods with cold Water and evaporate the resulting liquid *in vacuo*, so that 1 of Fluid Extract shall equal 1 of Senna Pods.

INFUSUM SENNÆ CONCENTRATUM.—Senna Leaves, broken small, 80; Strong Tincture of Ginger, 2·5; Dilute Chloroform Water (1 in 1000), sufficient to make 100. Prepare by macero-expression. After completing the process, add the Strong Tincture of Ginger. Heat in a closed vessel by means of a water-bath to a temperature of 85° C., and maintain thereat for 5 minutes. Dose.—½ to 1 fl. drm.; as a draught, 2 fl. drm. diluted with Water. *Farr* and *Wright*, *P.J.* '06, i. 165 and '07, i. 622; *C.D.* '06., i. 252; and *Y.B.P.* 1907, 251.

The *B.P.C.* includes a modification of this, the macero-expression is conducted with a mixture of Alcohol (90 p.c.), 1; Diluted Chloroform Water, 3; in place of the Chloroform Water as given above.

INFUSUM SENNÆ COMPOSITUM.—Senna, 6; Manna, 12; Magnesium Sulphate, 12; Fennel, bruised, 2; Boiling Water, 80; Cold Water, *q.s.* to make 100. Upon the Senna, Manna and Fennel pour the boiling Water and macerate for half an hour, strain with expression, dissolve the Magnesium Sulphate in the infusion and again strain and pass cold Water through the strainer to make 100.—*U.S.P.*

Dose.—4 fl. oz. = 113·6 c.c.

This has been incorporated in the *B.P.C.*

LAVEMENT PURGATIF.—Pour 500 of boiling Water on to 15 of Senna Leaves and infuse half an hour, strain through a cloth, press, and dissolve in the fluid 15 of Sodium Sulphate.—*Fr.*

ACIDUM CATHARTICUM.—According to Stockman, Cathartic Acid is a coloured glucoside. In the free state it is easily decomposed. It acts locally as an irritant and hence as a purgative when introduced into the alimentary canal. —*P.J.* (3) xv. 751.

Bourgoin and Bouchut, in a lengthy investigation on Cathartic Acid and Senna, conclude, 'As a general result of this inquiry it appears that the best preparation is the Infusion of Senna.'—*P.J.* (3) ii. 223.

SERPENTARIÆ RHIZOMA.

SERPENTARY RHIZOME.

The dried Rhizome and Roots of *Aristolochia Serpentaria*, L., *Virginian Snakeroot*, or of *Aristolochia reticulata*, Nutt., *Texan* or *Red River Snakeroot.*

From the southern parts of North America.

Under the title of **Aristolochia** the dried Stem and Root of *Aristolochia indica*, L., are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Medicinal Properties.—A bitter stomachic. *See* Calumba.

Dose.—10 to 15 grains = 0·65 to 1 gramme.

Official Preparations.—Infusum Serpentariæ, Liquor Serpentariæ Concentratus, and Tinctura Serpentariæ. Used in the preparation of Tinctura Cinchonæ Composita.

Not Official.—Infusum Serpentariæ Concentratum.

Foreign Pharmacopœias.—Official in Mex., Port. and U.S.

Descriptive Notes.—In the *B.P.* 1864 and 1867 the root of Aristolochia Serpentaria was alone official, but the drug was rarely met with in commerce, the root of the Texan species, *A. reticulata*, being the article representing it in this country. In the *B.P.* 1885 and 1898 the latter species was made official, as well as the Virginian (*A. Serpentaria*), and both are now obtainable. The latter has much more slender, matted, fibrous, furrowed roots, those of *A. reticulata* being longer, thicker, straighter and smoother. The rhizome of *A. Serpentaria* is about 1 in. (25 mm.) long and ⅛ in. (3 mm.) in diameter, bearing on its upper surface the remains of aerial stems, and the numerous slender, very interlacing roots are about 3 in. (75 mm.) long, yellowish-brown in colour, have a bitter taste, and an odour recalling those of Camphor, Turpentine and Valerian. The rhizome of *Spigelia Marilandica*, L., resembles that of *A. Serpentaria* in size and appearance, but it is not aromatic.

The characteristic microscopic features of Serpentary Root are the cuboid cells of the outer bark, the porous cuboid cells of the medullary rays, the oil cells in the mesophlœum, and the abundance of starch.

Tests.—Serpentary Rhizome contains from 7 to 10 p.c. of ash. An ash limit is not considered necessary.

Preparations.

INFUSUM SERPENTARIÆ. Infusion of Serpentary.

Serpentary Rhizome, in No. 10 powder, 1; boiling Distilled Water, 20. Infuse 15 minutes, and strain. (1 in 20)

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

LIQUOR SERPENTARIÆ CONCENTRATUS. CONCENTRATED SOLUTION OF SERPENTARY.

A fluid extract (1 in 2) made with Alcohol (20 p.c.). (1 in 2)

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c.

Tests.—Concentrated Solution of Serpentary has a sp. gr. of 0·990 to 1·000; it contains about 5 p.c. w/v of total solids and about 18 p.c. w/v of Absolute Alcohol.

A corresponding preparation, **Liquor Aristolochiæ Concentratus** (1 in 2), dose, 30 to 120 minims = 1·8 to 7·1 c.c., is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

TINCTURA SERPENTARIÆ. TINCTURE OF SERPENTARY.

1 Serpentary Rhizome, percolated with Alcohol (70 p.c.), to yield 5. (1 in 5)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Mex. and U.S., 1 in 5. U.S. has also **Fluid Extract.**

Tests.—Tincture of Serpentary has a sp. gr. of 0·895 to 0·900; it contains about 2 p.c. w/v of total solids and about 68 p.c. w/v of Absolute Alcohol.

A corresponding preparation, **Tinctura Aristolochiæ** (1 in 5), dose, 30 to 60 minims = 1·8 to 3·6 c.c., is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Not Official.

INFUSUM SERPENTARIÆ CONCENTRATUM.—Serpentary Rhizome, in No. 20 powder, 40; Alcohol (90 p.c.), 25; Dilute Chloroform Water (1 in 1000), *q.s.* to make 100. Prepare by repercolation.—*Farr* and *Wright, P.J.* '06, i. 165 and '07, i. 622; *C.D.* '06, i. 252; and *Y.B.P.* 1907, 251.

This appears in the *B.P.C.*

SEVUM PRÆPARATUM.

PREPARED SUET.

FR., SUIF DE MOUTON PURIFIÉ; GER., HAMMELTALG; ITAL., GRASSO DI MONTONE; SPAN., SEBO DE CARNERO.

A white, almost inodorous, fatty substance, having a bland taste and unctuous to the touch. It is insoluble in Water. It is described in both *B.P.* and *U.S.P.* as the internal fat of the abdomen of the sheep, *Ovis Aries*, L., purified by melting and straining. The *U.S.P.* states that Prepared Suet should be kept in well-closed vessels impervious to fat. The *B.P.* gives no directions as to the precautions necessary in storage. The *U.S.P.* also states that it should not be used after it has become rancid.

Official Preparation.—Used in the preparation of Unguentum Hydrargyri.

Foreign Pharmacopœias.—Official in all except Belg., Dutch and Russ.; Fr. (Suif de Mouton Purifié); Ital. (Grasso di Montone); Mex., Port. and Span. (Sebo).

Tests.—Prepared Suet possesses a m.p. of from 45° to 50° C. (113° to 122° F.); the *B.P.* states from 44·4° to 48·9° C. (112° to 120° F.); the *U.S.P.* from 45° to 50° C. (113° to 122° F.); the *P.G.* from 47° to 50° C. (116·6° to 122° F.). The solidifying point is about 38° C. (100·4° F.); the *B.P.* states 37·8° C. (100° F.); the *U.S.P.* 37° to 40° C. (98·6° to 104° F.); the *P.G.* does not mention a solidifying point. It is officially required to be freely soluble in Benzol, insoluble in cold Alcohol (90 p.c.), and slightly soluble in Ether or boiling Alcohol (90 p.c.). Acid, Saponification, and Iodine values might with advantage have been included. The Acid value ranges from 0·8 to 2, the Saponification value from 192 to 195, the Iodine value from 33 to 46.

It is officially stated that in India Benzoated Suet should be used in place of Benzoated Lard, *see* p. 100.

Not Official.

SIMARUBA.

BITTER SIMARUBA, OR MOUNTAIN DAMSON.

The Root-bark of *Simaruba officinalis*, DC., from the West Indies.

Medicinal Properties.—A bitter tonic and astringent. In large doses causes nausea. Principally used in chronic forms of dysentery; may be combined with Opium.

Dose.—15 to 30 grains = 1 to 2 grammes.

Foreign Pharmacopœias.—Official in Dutch, Mex., Port. and Swiss.

SINAPIS.

MUSTARD.

Fr., Moutarde; Ger., Senfsamen; Ital., Senape Nera; Span., Mostaza.

The powdered and mixed dried ripe Seeds of *Brassica nigra* and *Brassica alba*.

The whole virtue of Mustard depends upon the fact that when mixed with Water, Allyl Thiocarbimide (Volatile Oil of Mustard) is formed. This compound is produced by the action of Myrosin upon Myronic Acid in the same way in which the Emulsin and Amygdalin react in the formation of Volatile Oil of Bitter Almonds. Black Mustard contains Myrosin and a large excess of Myronic Acid, and so is in itself able to produce the Volatile Oil to some extent. White Mustard contains Myrosin but no Myronic Acid, and so can by itself produce none of the Volatile Oil. The best result is obtained by mixing the black and white variety in such proportions that the Myrosin and the Myronic Acid will balance each other.

Medicinal Properties.—A powerful stimulant and sialagogue. The powder is taken internally as a condiment; a tablespoonful in a tumblerful of warm Water acts as a prompt emetic; used externally in form of poultice or charta, as a rubefacient and counterirritant in pneumonia, pleurisy, muscular rheumatism, pericarditis, bronchitis, colic, gastralgia, vomiting and neuralgia; as a sitz-bath in amenorrhœa.

Official Preparations.—Charta Sinapis, Linimentum Sinapis, and Oleum Sinapis Volatile.

Not Official.—Applicatio Sinapis, Cataplasma Sinapis, Infusum Sinapis, Thiosinamin and Fibrolysin.

Foreign Pharmacopœias.—Official in Port. (Mostarde).

Tests.—Mustard yields about 5 p.c. of ash. It is officially required that a cold decoction should not be rendered brown by Boric Acid Solution, indicating the absence of Turmeric, nor should it yield a distinctive reaction with the tests for Starch. The test for Turmeric may be conveniently carried out with Methylated Spirit as a solvent instead of Water. About 1 gramme of the specimen should be boiled with Methylated Spirit, filtered, the filtered liquid concentrated and tested with Boric Acid Solution. The Iodine test for the presence of Starch is rendered negative, owing to the ready absorption of the Iodine by the volatile Oil developed on the addition of Water. In carrying out the Iodine test for Starch on the powdered seeds of the White or Black Mustard, the *U.S.P.* directs that 1 gramme of the powdered Mustard should be exhausted by slow percolation with Alcohol (94·9 p.c.), the marc mixed with 200 c.c. of Water and heated to boiling, adding after cooling sufficient cold Water to make the mixture measure 1000 c.c.; the addition of 4 c.c. of Tenth-normal Volumetric Iodine Solution should not produce a dark blue colour. The *German Pharmacopœia* includes a quantitative method for the determination of the ethereal Oil. A weighed quantity of 5 grammes of the powdered Mustard is digested in a flask with 100 c.c. of Water at a temperature of 20° to 25° C. (68° to 77° F.). The stoppered flask is allowed to remain at rest for 2 hours; to the contents are then added 20 c.c. of Alcohol (90 p.c.) and 2 c.c. of Olive Oil, the flask connected with a well-cooled condenser, and the mixture is distilled. The first 40 to 50 c.c. of distillate is collected in a graduated flask of 100 c.c. capacity, containing 10 c.c. of Ammonia Solution, and 20 c.c. of Tenth-normal Silver Nitrate Solution are added. The mixture is then diluted with Water to the mark on the neck and allowed to stand in a stoppered flask for 24 hours, with intervals of frequent shaking. To a measured quantity (50 c.c.) of the clear filtrate is then added 6 c.c. of Nitric Acid and 1 c.c. of Ferric Ammonium Sulphate Solution, and the mixture is titrated with Tenth-normal Volumetric Ammonium Rhodanate Solution until a red coloration appears, not more than 7·2 c.c. of this solution should be required; each c.c. of Tenth-normal Volumetric Silver Nitrate Solution absorbed represents 0·0049575 gramme of Allyl Thiocarbimide. The amount of Water present should not exceed 5 p.c.

SINAPIS ALBÆ SEMINA. WHITE MUSTARD SEED.

The dried ripe Seeds of *Brassica alba*.

Descriptive Notes.—The White Mustard Seed of commerce is often a mixed article, depending upon its geographical source, but the official article is the seed of *Brassica alba*, Boiss. (*Sinapis alba*, L.). The seed is yellowish, about $\frac{1}{12}$ in. (2 mm.) in diameter and $\frac{1}{10}$ of a grain in weight (*Pharmacographia*, p. 69). The testa appears to be smooth, but under a good lens is seen to be minutely and reticulately pitted. The embryo is of a bright, pure yellow colour and oily. It has no pungent odour until triturated with Water. The outer layer of epidermal cells contains mucilage and swells up rapidly in Water, a property which is sometimes taken advantage of for drying bottles intended to contain oily liquids, and from which it is necessary to remove the last trace of moisture. This is quickly effected by shaking a small quantity of White Mustard Seed in the bottle. The seeds of a false White Mustard, named by Harz *Brassica iberifolia*, have been substituted for those of *B. alba*, but they are slightly more ochreous in colour, the hilum is darker than the rest of the seed, and the epidermal cells are not mucilaginous.

The pods containing White Mustard Seed are spreading, and have bristly hairs, and half their length is occupied by a flat, veiny beak. In Black Mustard the pods are erect and glabrous, and the short beak is slender and quadrangular.

The seeds of *S. glauca*, Roxb. (*B. campestris*, L.), resemble those of *B. alba* and probably form part of the White Mustard Seed of India.

SINAPIS NIGRÆ SEMINA. Black Mustard Seed.

The dried ripe Seeds of *Brassica nigra*, Koch.

Descriptive Notes.—The Black Mustard Seed of commerce is usually brown rather than black, and often consists chiefly of the slightly larger and more oblong Indian or Sarepta Mustard Seeds, which are the produce of *Brassica juncea*, Cass. The seeds of *Brassica nigra*, Koch, which are official under the name of Sinapis Nigræ Semina, are $\frac{1}{25}$ in. (1 mm.) in diameter and $\frac{1}{50}$ of a grain in weight and of a dark reddish-brown or greyish-brown colour, and have at first a bitter and quickly afterwards a very pungent taste. Although reticulated with minute pits when dry, the surface of the seed appears smooth when wetted, owing to the development of mucilage from the outer walls of the epidermal cells. The whitish pellicle, which gives the greyish tint to some of the seeds, is attributed to rain during the ripening, and depreciates the value of the seed in the market; this pellicle is formed from hexagonal tabular cells. The seed contains about 20 p.c. of fixed Oil, which is expressed and sold separately as a remedy for rheumatism, although it is used in Russia like the best Olive Oil (*Pharmacographia*). The ferment Myrosin is coagulated at 140° F. (60° C.), so that boiling Water must not be used in making Mustard plasters. The prepared Mustard leaves must be kept quite dry, or the ferment gradually acts in the presence of the moisture attracted from the air, and the Mustard leaves lose their efficacy. Powdered Mustard that has become damp is liable to become attacked by the cheese mite *Tyroglyphus Siro*, Gerv. The distinctive microscopic features of powdered Mustard are the absence of Starch and raphides; the mucilaginous epidermal polygonal cells, appearing striated when wet, large collenchymatous cells, and the yellow sclerenchyma of *S. alba*, and the dark yellowish-brown sclerenchymatous cells of *S. nigra*, some of which are rather longer and form a hexagonal network, and the small, irregular aleurone grains (0·017 mm. long and 0·008 mm. broad) containing minute globoids and drops of fixed oil.

Preparations.

CHARTA SINAPIS. Mustard Paper.

Extract by Benzol the fixed Oil from a mixture of equal weights of bruised Black and White Mustard Seeds; dry, and reduce to No. 60 powder; mix 75 grains of it with 5 fl. drm. of Solution of India-rubber, and spread by means of a suitable brush over about 30 sq. in. of one side of a piece of cartridge paper. Allow it to dry by exposure to the air.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Norw.; Fr. (Sinapismes en Feuilles); Dan., Ger., Hung. and Swed. (Charta Sinapisata); Ital. (Carta Senapata); Mex. (Sinapismos de Papel); Span. (Papel Sinapico); Russ. (Charta Sinapina); Swiss and U.S.

LINIMENTUM SINAPIS. Liniment of Mustard.

Volatile Oil of Mustard, 1½ fl. drm.; Camphor, 120 grains; Castor Oil, 5 fl. drm.; Alcohol (90 p.c.), 4 fl. oz.

Now about 1 in 27 instead of 1 in 40, and Ethereal Extract of Mezereon omitted.

As the volatile Oil quickly disappears on keeping, it is better to keep the other ingredients ready mixed, and to add the Mustard Oil when required.

Spiritus Sinapis.—Austr. and Hung., Oil 1, Spirit 50; Belg., Ger., Jap., Russ., Swed. and Swiss, Oil 1, Spirit 49; Mex. (Linimento de Mostaza Compuesto), 1 in 38. All by weight.

OLEUM SINAPIS VOLATILE. Volatile Oil of Mustard.

An almost colourless, or pale yellow, highly refractive, limpid, oily liquid, possessing a very characteristic, penetrating, pungent, and excessively irritating odour. It is the volatile oil distilled from Black Mustard Seeds after maceration with Water.

The *B.P.* describes the Oil as distilled from Black Mustard Seeds after maceration with Water. The *U.S.P.* describes it as a volatile Oil obtained from Black Mustard (freed from its fatty oil by maceration with Water and subsequent distillation). The *P.G.* describes it as a volatile Oil obtained by distillation from powdered Mustard Seeds which have been macerated in Water. The *B.P.* do not require it to contain any definite percentage of Allyl Iso-thiocyanate. The *U.S.P.* requires that it shall contain not less than 92 p.c. The *P.G.* requires that it shall contain from 92·4 to 99 p.c.

It should be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere and protected as far as possible from contact with the light. Its vapour is intensely irritating, and the greatest caution should be exercised in handling the oil.

Solubility.—1 in 50 of Water; readily in Alcohol (90 p.c.) and Ether.

Medicinal Properties.—Applied to the skin, it produces almost instant vesication, but when diluted it forms a useful counter-irritant application.

Foreign Pharmacopœias.—Official in all except Dan.

Tests.—Volatile Oil of Mustard has a sp. gr. of 1·015 to 1·030. The *B.P.* states 1·018 to 1·030, the *U.S.P.* 1·013 to 1·020 at 25° C. (77° F.), the *P.G.* 1·018 to 1·025. It boils at 148° C. (298·4° F.), and distils between this temperature and 153° C. (307·4° F.). It is officially stated to distil between 147·2° and 152·2° C. (297° and 306° F.); the *U.S.P.* states that if a portion of the Oil be heated in a flask connected with a well-cooled condenser it should distil completely between 148° and 152° C. (298·4° and 305·6° F.). The *P.G.* that the boiling point is between 148° and 152° C. (298·4° and 305·6° F.); with the simple statement of these physical characteristics the *B.P.* is content. The *U.S.P.* and the *P.G.* state that if to 3 grammes of the Oil 6 grammes of Sulphuric Acid be gradually added, keeping the liquid cool, the mixture upon subsequent digestion will evolve Sulphur Dioxide gas, that it will remain of a light yellow colour, and although at first clear will afterwards become thick and occasionally crystalline, and will lose its pungent odour. These two Pharmacopœias also mention that when diluted with 5 times its volume of Alcohol (94·9 p.c. *U.S.P.*, 90 p.c. *P.G.*) the addition of a drop of Ferric Chloride Test Solution shall produce no blue or violet coloration. The *B.P.* does not introduce a method of assay. The *U.S.P.* requires that it shall contain not less than 92 p.c. of Allyl Iso-thiocyanate as determined by a process of which the following are the essential details:—A quantity of about 2 grammes of the Oil is accurately weighed and diluted with sufficient Alcohol (94·9 p.c.) to produce a solution, 50 c.c. of which shall represent 1 gramme of the Oil. A measured quantity of 5 c.c. of this solution is transferred to 100 c.c. measuring flask, and 30 c.c. of Tenth-normal Volumetric Silver Nitrate Solution and 5 c.c. of Ammonia Solution added. After well stoppering the flask the mixture is set aside in a dark place for 24 hours; then heated in a water-bath at a temperature of 80° C. (176° F.) for half an hour, with frequent intervals of shaking, the contents of the flask are diluted to the 100 c.c. mark and filtered. A measured quantity of 50 c.c. of the filtrate is mixed with 4 c.c. of Nitric Acid and a few drops of Ferric Ammonium Sulphate T.S. and sufficient Tenth-normal Volumetric Potassium Sulphocyanate Solution to produce a permanent red colour is added; not more than 5·6 c.c. of such solution should be required. Each c.c. of Tenth-normal Volumetric Silver Nitrate Solution absorbed corresponds to 0·00492 gramme of Allyl Iso-thiocyanate. The *P.G* process is essentially as follows:—A measured quantity of 5 c.c. of a 1 in 50 w/w solution of the Oil in Alcohol (90 p.c.) is transferred to a 100 c.c. stoppered measuring flask, 50 c.c. of Tenth-normal Volumetric Silver Nitrate Solution and 10 c.c. of Ammonia Solution added, and the flask is well stoppered and the mixture allowed to stand for 24 hours, with intervals of vigorous shaking. It is then diluted with Water to the 100 c.c. mark. A measured quantity of 50 c.c. of the clear filtrate is mixed with 6 c.c. of Nitric Acid and 1 c.c. of Ferric Ammonium Sulphate Solution, and sufficient Tenth-normal Volumetric Ammonium Rhodanate Solution added to produce a red coloration; from 16·6 to 17·2 c.c. shall be required, *P.G.*

Owing to the results yielded by the *P.G.* method being invariably too low, the following modifications of the *P.G.* method are suggested by Schimmel in the *Berichte* for April 1908:—A measured quantity of 5 c.c. of a 1–50 solution of the Oil in Alcohol (90 p.c.) is mixed in a 100 c.c. stoppered measuring flask with 10 c.c. of Ammonia Solution and 50 c.c. of Tenth-normal Volumetric Silver Nitrate Solution, and after closing the flask with a cork provided with a reflux tube 1 metre long it is heated for about 1 hour on a water-bath which is kept vigorously boiling. After cooling to 15° C. (59° F.) and diluting with Distilled Water to the mark, it is filtered, a measured quantity of 50 c.c. of the clear filtrate, after addition of sufficient Nitric Acid to produce a faintly acid reaction, is titrated with Tenth-normal Volumetric Ammonium Rhodanate Solution until the appearance of a red colour, 1 c.c. of Ferric Ammonium Sulphate Solution being added as an indicator; from 16·6 to 17·2 c.c. of the solution should be necessary. The *P.G.* figures require that it shall contain from 92·4 to 99·0 p.c., calculated as Allyl Iso-thiocyanate. It is preferably determined by the above process.

The more generally occurring impurities are Ethyl Alcohol, Petroleum, Chloroform, fatty oils, Carbon Bisulphide, Phenols. The requirement that the Oil shall distil between 147·2° and 152·2° C. (297° and 306° F.), and that the first and last portions of the distillate should have the same sp. gr. as the original Oil, precludes the presence of Ethyl Alcohol, Petroleum, Chloroform, fatty oils and Carbon Bisulphide. For the actual determination of Carbon Bisulphide, Schimmel recommends the following process:—A weighed quantity of 20 to 25 grammes of the Oil are heated on a water-bath while a slow current of air is passed through the Oil, the vapour of Carbon Bisulphide which is thus carried off is cooled by passing through a condenser and conducted into an alcoholic Potassium Hydroxide Solution, where it is converted into Potassium Ethyl Xanthate. After the neutralisation of the alkali solution, sufficient Tenth-normal Volumetric Copper Sulphate Solution is added until a drop produces a reddish-brown colour with Potassium Ferrocyanide. From the amount of Copper Solution consumed the percentage of Carbon Bisulphide present can be ascertained. 1 c.c. of Tenth-normal Volumetric Copper Sulphate Solution corresponds to 0·0152 gramme of Carbon Bisulphide. The volumetric process may be supplemented by a gravimetric one, the precipitate of Cuprous Ethyl Xanthate may be collected on a filter, washed, dried and heated to a red heat in a crucible and the residue of Cupric Oxide weighed. 1 gramme of the Oxide corresponds to 1·198 grammes of Carbon Bisulphide. Phenols, if present, may be detected by the test with Ferric Chloride T.S. described above.

Not Official.

APPLICATIO SINAPIS.—Volatile Oil of Mustard, 4 minims; Eau de Cologne, 1 fl. oz. Mix.

A good application in acute catarrh of the middle ear; to be applied behind the ear by means of a brush or absorbent Wool.

CATAPLASMA SINAPIS.—Mustard, in powder, 2½ oz. or *q.s.*; Linseed Meal, 2½ oz.; boiling Water and Water, of each a sufficiency.—*B.P.* '85.

Mix the Mustard with 2 or 3 oz. of lukewarm Water, mix the Linseed Meal with 6 to 8 oz. of boiling Water, add the former to the latter and stir together.

Crushed Linseed, 28; Mustard, 2; Water, *q.s.* to make 100.—*B.P.C.*

This is similar to the following:—

Make a Linseed Poultice by adding 4 parts of crushed Linseed to 10 parts of boiling Water, and for every 4 oz. of crushed Linseed employed add ¼ oz. of Mustard, previously rubbed to a smooth paste with a little cold or tepid Water.—*St. Thomas's.*

INFUSUM SINAPIS.—Mustard, 2 drm.; boiling Water, 4 fl. oz.; strain. It relieves obstinate hiccough.

THIOSINAMIN (Allyl-thio-carbamide).—White, glistening crystals, generally odourless, but sometimes possessing a faint, garlic odour; soluble 1 in 17 of Water, 1 in 2 of Alcohol (90 p.c.) and soluble in Ether. It has been found useful for softening scar tissues and the removal of fibrous stricture of the œsophagus, etc., and has also been used in the treatment of lupus.

Employed in the form of a 15 to 20 p.c. alcoholic solution, ½ to 1 syringeful being injected between the scapulæ; or as an 8 p.c. solution in Water containing 20 p.c. Glycerin, 20 minims being injected, in divided portions, in the neighbourhood of the growth.—*B.M.J.E.* '02, i. 91; '04, i. 75; *B.M.J.* '03, i. 656; *L.* '03, i. 785; *C.D.* '02, i. 538; *P.J.* '02, ii. 201.

Fibrolysin.—In arthritis deformans with contractures, and in old-standing urethral stricture.—*Pr.* '07, i. 427. Successful in treating gastric adhesions.—*F.T.* '07, 88.

In perigastric adhesions, pyloric stricture, hourglass stomach, and conditions in which there is new formation of connective tissue, it may be given (*B.M.J.* '05, ii. 811) hypodermically in the form of a 10 p.c. solution with 70 parts of Water and 20 parts of Alcohol. It has been successfully used (*B.M.J.* '06, i. 379) in the treatment of hypertrophy of the pylorus. 10 minims of a 10 p.c. solution in Alcohol injected daily for 1 week, then every other day for 14 days, then 3 times a week for 6 weeks, then twice a week for a month, and then 15 minims once a week for another 3 months.

SODIUM.

SODIUM.

Na, eq. 22·88.

A light, soft metal, exhibiting a silvery metallic lustre when freshly cut, but which rapidly oxidises in contact with air. It should be preserved under mineral Naphtha in well-stoppered glass bottles.

Metallic Sodium is not official in either the *U.S.P.* or the *P.G.*

The only direct official preparation of Sodium is **Liquor Sodii Ethylatis.** *See* SODII ETHYLATIS LIQUOR, p. 1115.

Tests.—Sodium has a sp. gr. of 0·97. It possesses a strong affinity for Oxygen and rapidly oxidises in the air when cut. When thrown on to cold Water it instantly fuses to a globule without combustion and traverses the surface in all directions; when thrown on to hot Water, however, or if its movements be circumscribed, combustion of the evolved Hydrogen ensues. The Water acquires an alkaline reaction towards red Litmus paper. It is officially mentioned that Water and Alcohol (90 p.c.) are vigorously attacked by it, Hydrogen being simultaneously evolved; the metal is almost entirely dissolved, leaving little or no insoluble residue. It is required to indicate at least 97·46 p.c. of metallic Sodium as determined by very cautiously adding 1 gramme of Water, and titrating the resulting solution with Normal Volumetric Sulphuric Acid Solution; at least 42·6 c.c. are officially required for neutralisation. The *B.P.* does not mention which indicator of neutrality should be used, but Phenolphthalein Solution may be most conveniently employed. When evaporated to dryness, the residue yields a brilliant yellow coloration when moistened with Hydrochloric Acid and introduced on a platinum wire into a non-luminous flame.

Not Official.

SODA CAUSTICA.

White, hygroscopic pencils, or sticks, possessing a crystalline structure, or as a white, crystalline, deliquescent powder, or in fused masses. It should be kept in well-closed hard glass bottles and exposed as little as possible to the air, as it readily absorbs moisture and Carbonic Anhydride from the air. It is necessary when handling it to exercise very great caution, as it has a strong action on the skin, and the dust from the powder is very irritating to the eyes and nose. The *B.P.* does not state any requisite percentage of pure Sodium Hydroxide, the *U.S.P.* requires that it shall contain not less than 90 p.c. of pure anhydrous Sodium Hydroxide, and not more than 2 p.c. of other inorganic substances with the exception of Water; it is not official in the *P.G.* A purified Sodium Hydroxide and a pure Sodium Hydroxide are also official in the *B.P.* Appendix; the latter is only required in testing for traces of Aluminium. It is officially directed to be obtained by dissolving Sodium Hydroxide in Ethyl Alcohol, filtering the solution, evaporating to dryness in a silver dish, adding Distilled Water occasionally during evaporation.

Foreign Pharmacopœias.—Official in Austr. (Natrium hydroxydatum); Dan., Dutch and Swed. (Hydras Natricus); Ital. (Soda Caustica); Jap. (Natrum Causticum); Port. (Hydrato de Soda); Span. (Hidrato Sodico); Swiss (Natrium Hydricum); U.S. (Sodii Hydroxidum).

The Solution is official in Austr. (Natrium Hydroxydatum Solutum) (15 p.c.), sp. gr. 1·169 to 1·172; Dutch (Solutio Hydratis Natrici) (13½ p.c.), sp. gr. 1·155; Fr. (Soude Caustique Liquide) (about 30 p.c.), sp. gr. 1·332; Ger. (Liquor Natri Caustici) (15 p.c.), sp. gr. 1·168 to 1·172; Hung. (Natrium Hydroxydatum Solutum) (32 p.c.), sp. gr. 1·35; Port. (Hydrato de Soda Liquido), sp. gr. 1·33; Span. (Solucion de Sosa Caustica) (30 p.c.), sp. gr. 1·33; Swed. (Solutio Hydratis Natrici) (25 p.c.), sp. gr. 1·275 to 1·285; Swiss (Natrium Hydricum Solutum) (30 p.c.), sp. gr. 1·33; U.S. (Liquor Sodii Hydroxidi) (about 5 p.c.), sp. gr. 1·056 at 25° C. (77° F.).

Antidotes.—Same as Liquor Potassæ, p. 930.

Pasta Londinensis.—Caustic Soda, Unslaked Lime, equal parts, reduced to a fine powder, and kept in a well-closed bottle. To be made into a paste with Water when required.

Tests.—Sodium Hydroxide dissolves readily and completely in Water, the solution even when very highly diluted has a strong alkaline reaction towards red Litmus paper. Sodium Hydroxide may be readily determined by direct titration with Normal Volumetric Sulphuric Acid Solution, using Phenolphthalein Solution as an indicator of neutrality. The quantity of Carbonate present in commercial samples is scarcely sufficient to vitiate the results when working on the small quantities required for that titration. When Methyl Orange Solution is employed as an indicator of neutrality, the Carbonate present is also estimated. 1 c.c. of Normal Volumetric Sulphuric Acid Solution is equivalent to 0·03976 gramme of pure anhydrous Sodium Hydroxide. The *B.P.* gives no requisite percentage of Sodium Hydroxide. The *U.S.P.* requires that it shall contain not less than 90 p.c. of pure anhydrous Sodium Hydroxide, as determined by introducing about 1 gramme of the salt into a stoppered weighing bottle and accurately ascertaining its weight, dissolving in about 50 c.c. of Water, and titrating the Solution with Normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as an indicator of neutrality, the number of c.c. of Normal Volumetric Sulphuric Acid Solution required multiplied by 3·976, the product divided by the weight of Sodium Hydroxide taken, the quotient represents the percentage of pure anhydrous Sodium Hydroxide present. When neutralised with Hydrochloric Acid, the product when introduced on a platinum wire into the non-luminous flame affords a brilliant yellow coloration. The *U.S.P.* states that when heated to about 525° C. (977° F.) it melts to a clear oily liquid and is slowly volatilised unchanged at a bright red heat.

The more generally occurring impurities are organic matter, and insoluble impurities, heavy metals such as Arsenic, Copper, Lead, Iron and Zinc, Potassium Carbonate, Silicate, Chlorides and Sulphates. The 1 in 20 aqueous solution should be perfectly clear and colourless, indicating the absence of organic matter and insoluble impurities. When acidulated with Hydrochloric Acid it should yield no coloration or precipitate with Hydrogen Sulphide, nor should any coloration or precipitate ensue upon the subsequent addition of Ammonia Solution, indicating the absence of heavy metals. A 5 p.c. aqueous solution after acidification with Acetic Acid should yield no precipitate on the addition of Tartaric Acid, indicating the absence of Potassium. It should not yield more than a faint effervescence when a slight excess of diluted Sulphuric Acid is added to 10 c.c. of a 10 p.c. solution, indicating the limit of Carbonate. When 0·7 of a gramme of Sodium Hydroxide is dissolved in 1·5 c.c. of Water, this solution should not yield more than a slight white precipitate, within 10 minutes, when added to 10 c.c. of Alcohol (94·9 p.c.) indicating a limit of Silicate. A 5 p.c. solution when acidified with Nitric Acid should not yield more than a faint turbidity with Silver Nitrate or Barium Chloride Solution, indicating the absence of more than traces of Chlorides and Sulphates. The *B.P.* includes also Aluminium and and Phosphates as likely impurities. Aluminium, if present, may be detected by neutralising the Hydroxide with Hydrochloric Acid, adding Ammonium Chloride and Ammonia Solution and boiling, no white flocculent precipitate should be produced. A 5 p.c. aqueous solution should not afford a yellow precipitate when acidified with Nitric Acid and warmed with Ammonium Molybdate T.S., indicating the absence of Phosphates. The purified Sodium Hydroxide of the *B.P.* is required to yield no characteristic reactions with the tests for Phosphates or Sulphates, and not more than the slightest reactions with the tests for Carbonates, but need not necessarily be quite free from Alumina.

LIQUOR SODII HYDROXIDI.—Solution of Sodium Hydroxide. Purified Sodium Hydroxide, 200 grammes; Distilled Water, sufficient to produce 1000 c.c. The purified Sodium Hydroxide is dissolved in a portion of the Distilled Water, the solution made up to 1000 c.c. and filtered.

Tests.—Solution of Caustic Soda *B.P.* has a sp. gr. of about 1·175. It contains about 18·0 p.c. of pure anhydrous Sodium Hydroxide, as determined by titrating a measured quantity of the Liquor with Normal Volumetric Acid Solution, using Phenolphthalein Solution as an indicator of neutrality. The *B.P.* does not mention any requisite percentage, the *U.S.P.* Liquor has a sp. gr. of about 1·056 at 25° C. (77° F.) and is required to contain about 5 p.c. of pure anhydrous Sodium Hydroxide. About 25 c.c. of Normal Volumetric Sulphuric Acid Solution are stated to be necessary to neutralise 20 c.c. (19·9 grammes) of the solution, using Methyl Orange T.S. as an indicator of neutrality. 1 c.c of Normal Volumetric Sulphuric Acid indicates 0·2 p.c. of absolute Sodium Hydroxide. The *P.G.* Liquor has a sp. gr. of 1·168 to 1·172, it is required to contain about 15 p.c. w/w of absolute Sodium Hydroxide. The *B.P.* solution naturally should be free from such impurities as are precluded from Sodium Hydroxide or purified Sodium Hydroxide. The *U.S.P.* Liquor is required to answer the same reactions and tests as an aqueous solution of Sodium Hydroxide. The *P.G.* Liquor is required to be free from Carbonates, to contain only traces of Chlorides and Sulphates, to be free from Nitrates, and to contain only traces of Aluminium.

SODA TARTARATA.

SODIUM POTASSIUM TARTRATE.

B.P.Syn.—Tartarated Soda; Tartrate of Potassium and Sodium; Rochelle Salt. *N.O. Syn.*—Tartarus Natronatus; Sal Polychrestum Seignette.

$KNaC_4H_4O_6, 4H_2O$, eq. 280·15.

Fr., Tartrate Droit de Sodium et de Potassium; Ger., Kaliumnatriumtartrat; Ital., Tartrato Sodico-Potassico; Span., Tartrato Sodico-Potasico.

Colourless, translucent, rhombic prisms, or a white, odourless powder, having a saline taste. It is prepared by neutralising the acid radicle of Acid Potassium Tartrate with Sodium Carbonate and recrystallisation.

It should be kept in well-closed vessels and exposed as little as possible to the air, as it has a slight tendency to effloresce.

Solubility.—1 in 1½ of Water; soluble in its own Water of crystallisation when hot; insoluble in Alcohol (90 p.c.).

Medicinal Properties.—A mild purgative, well suited for constipation associated with gout and hepatic dyspepsia. It is not aperient in small doses, its action then being diuretic, antilithic, and to render the urine alkaline.

Dose.—120 to 240 grains = 8 to 16 grammes.

Official Preparation.—Pulvis Sodæ Tartaratæ Effervescens.

Foreign Pharmacopœias.—Official in Austr. and Hung. (Kalium Natrio-tartaricum); Belg. (Kalium Natrium Tartaricum); Dan., Norw. and Swed. (Tartras Natrico-kalicus); Dutch (Tartras Kalico-natricus); Fr. (Tartrate Droit de Potassium et de Sodium); Ger. and Swiss (Tartarus Natronatus); Ital. (Tartrato Sodico-Potassico); Jap. and Russ. (Natrio-Kalium Tartaricum); Mex. (Tartrato de Potasio y Sodio); Port. (Tartrato de Potassæ de Soda); Span. (Tartrato Sodico-Potasico); U.S. (Potassii et Sodii Tartras).

Tests.—Tartarated Soda when heated fuses to a more or less colourless liquid and loses its Water of crystallisation, equivalent to 25·5 p.c. At a higher temperature it gradually becomes brown, and when still more strongly heated evolves an odour of burnt Sugar and leaves a black residue possessing a strong alkaline reaction. It dissolves readily in Water, forming a colourless solution possessing a faintly alkaline reaction towards Litmus paper. The *P.G.* states that it is neutral towards Litmus paper. The *U.S.P.* states that the aqueous solution does not effect Phenolphthalein Solution. The *B.P.* makes no mention of its reaction towards any indicator of neutrality. When incinerated and the residue is dissolved in diluted Hydrochloric Acid it yields a solution which answers the distinctive tests of Potassium and Sodium given under those headings. The aqueous solution affords, with Calcium Chloride Solution, a white granular precipitate soluble in a cold, moderately concentrated Potassium Hydroxide Solution, being again reprecipitated on boiling; with Silver Nitrate Solution it yields a white precipitate soluble in Nitric Acid and in

Ammonia Solution, and if just sufficient Ammonia Solution be added the precipitate redissolves and the mixture yields on boiling in a perfectly clean test-tube a mirror of metallic Silver. When a moderately concentrated solution of the salt is acidulated with Acetic Acid and mixed with a concentrated Potassium Acetate Solution it affords, when well stirred, a white precipitate, the precipitation being more pronounced on the addition of Alcohol (90 p.c.). When acidified with Acetic Acid it yields, on the addition of a drop of Ferrous Sulphate Solution, a few drops of Hydrogen Peroxide Solution and an excess of Potassium Hydroxide Solution, a purple or violet coloration. It is officially required to contain 98·0 p.c. of pure crystallised Sodium Potassium Tartrate, as volumetrically determined by the method given below under Volumetric Determination. The *U.S.P.* requires the salt to contain not less than 99 p.c. of pure Potassium and Sodium Tartrate, the process of determination being also a volumetric one and appearing below. The *P.G.* does not include a method of determination, nor does it state the amount of pure salt which it is requisite for a specimen to contain. As regards impurities, the *B.P.* does not mention any substances as likely impurities; the more generally occurring are Lead, Copper, Iron, Ammonium salts, Calcium, Sulphates and Chlorides. Lead, Copper and Iron may be detected by the Hydrogen Sulphide test, Ammonium salts by the Potassium or Sodium Hydroxide test, Calcium by the Ammonium Oxalate test, Sulphates and Chlorides by the Barium Nitrate and Silver Nitrate test described below. The absence of tests for impurities has apparently escaped the notice of those responsible for the *Report of the Committee of Reference in Pharmacy*, as no recommendation for their inclusion appears, and a limit of Lead as an impurity should have been included, not only in the present instance, but in the case of all Tartrates and Citrates. Standards have been suggested (*C.D.* '08, i. 796) of 10 parts per million for Lead, and 2 parts per million for Arsenic. A suitable limit for Lead in Tartaric Acid has been suggested as 10 in 1,000,000, *see* Tartaric Acid.

Hydrogen Sulphide.—The aqueous solution (1–20) of the salt should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Potassium or Sodium Hydroxide.—When heated with Sodium Hydroxide T.S. it should not evolve Ammonia, *P.G.* The *U.S.P.* uses Potassium Hydroxide T.S.

Barium Nitrate.—An aqueous solution (1-20) after the addition of Nitric Acid and the removal of the crystalline precipitate should not be affected by T.S. of Barium Nitrate, *P.G.*

Silver Nitrate.—An aqueous solution (1–20) of the salt after treatment as in previous test should not be rendered more than opalescent by T.S. of Silver Nitrate, *P.G.*

Ammonium Oxalate.—If 1 gramme of the salt be dissolved in 10 c.c. of Water and shaken with 5 c.c. of diluted Acetic Acid, the liquid poured off from the crystalline precipitate which separates out and diluted with an equal part of Water should not be affected within 1 minute by 8 drops of T.S. of Ammonium Oxalate, *P.G.*

Volumetric Determination.—If 1 gramme of the salt be thoroughly ignited at red heat, and the residue extracted with boiling Distilled Water until the washings cease to react with Methyl Orange T.S., the mixed filtrate and washings should require for complete neutralisation not less than 14·1 c.c. of Semi-normal Volumetric Solution of Hydrochloric Acid, Methyl Orange T.S. being used as indicator, *U.S.P.*

The residue from the ignition of 1 gramme of the salt dissolved in Water, should require for exact neutralisation not less than 7 c.c. of Volumetric Solution of Sulphuric Acid, *B.P.*

Preparation.

PULVIS SODÆ TARTARATÆ EFFERVESCENS. Effervescent Tartarated Soda Powder. Commonly known as Seidlitz Powder. *N.O.Syn.*—Pulvis Aerophorus Laxans; Pulvis Effervescens Laxans.

Sodium Potassium Tartrate, in dry powder, 120 grains; Sodium Bicarbonate, in dry powder, 40 grains. Mix. Wrap in blue paper. Tartaric Acid, in dry powder, 38 grains. Wrap in white paper.

Dose.—The quantities given above are intended for one dose. The powder in blue paper is first dissolved in about half a pint of Water, and the powder in white paper added to it and the whole taken during effervescence.

The chief Continental Pharmacopœias have a simple Effervescent Powder, made with Sodium Bicarbonate and Tartaric Acid, and also a compound powder containing similar ingredients to the above.

Official in all the Foreign Pharmacopœias except Fr. and Ital.
Fr. has Eau Saline Purgative gazeuse (Eau dite de Seidlitz), *see* p. 755.

Not Official.

SODII ACETAS.

SODIUM ACETATE.

$NaC_2H_3O_2 \cdot 3H_2O$, eq. 135·10.

Fr., Acétate de Sodium; Ger., Natriumacetat; Ital., Acetato di Sodio; Span., Acetato Sodìco.

Colourless, translucent, monoclinic prisms, or as a white, granular, crystalline powder, possessing a saline, bitter taste. The crystals are efflorescent in warm air, and should be kept in well-closed bottles in a cool place.

Sodium Acetate is not official in the *B.P.*, but is official in both the *U.S.P.* and the *P.G.*

Solubility.—1 in 1 of Water; 1 in 30 of Alcohol (90 p.c.).

It has been employed as a diuretic in place of the Potassium salt, but is rarely used medicinally. Used in the preparation of Acetic Ether.

Foreign Pharmacopœias.—Official in Fr., Ger., Hung., Ital., Jap., Mex., Russ., Swed., Swiss and U.S.

Tests.—Sodium Acetate liquefies when heated and loses its Water of crystallisation, equivalent to 39·7 p.c. The *U.S.P.* gives the liquefying point at 60° C. (140° F.), and states that at 123° C. (253·4° F.) it becomes dry and anhydrous. When still more strongly heated it is decomposed, evolving empyreumatic vapours and leaving a black residue, which when dissolved in Water possesses a strong alkaline reaction towards red Litmus paper, and which effervesces on the addition of diluted acid. The salt dissolves readily in Water, forming a colourless solution which is alkaline in reaction towards red Litmus paper, but which produces little or no coloration with Phenolphthalein Solution. The solution answers the tests distinctive of Sodium given under that heading, and the addition of Ferric Chloride T.S. produces a deep red coloration, the solution on boiling yielding a brown flocculent precipitate of basic Ferric Acetate. When warmed with Sulphuric Acid it evolves a strong acetous odour, and when warmed with Sulphuric Acid and a small quantity of Alcohol (90 p.c.) it yields the characteristic odour of Ethyl Acetate (Acetic Ether); a minute quantity of the anhydrous salt when heated with a correspondingly minute quantity of Arsenious Anhydride yields a characteristic and highly poisonous odour of Cacodyl Oxide. The *U.S.P.* requires it to contain at least 99·5 p.c. of pure Sodium Acetate as volumetrically determined by the process described below. The *P.G.* does not state what percentage of pure Sodium Acetate the salt should contain, nor does it give a method of determination.

The more generally occuring impurities are Arsenic, Lead, Copper, Iron and Zinc, Calcium, Potassium, Chlorides and Sulphates. Arsenic, if present, may be detected by the modified Gutzeit's test, Lead, Copper, Iron and Zinc, if present, may be detected by Hydrogen Sulphide, either in a solution rendered faintly acid by diluted Hydrochloric Acid, or in a solution rendered alkaline with Ammonia. Calcium, if present, by the addition of Ammonium Oxalate Solution to an aqueous solution of the salt; Potassium, if present, by the turbidity produced on the addition of Sodium Bitartrate T.S. to a saturated aqueous solution of the salt. A 10 p.c. aqueous solution should not be rendered turbid by the addition of Barium Nitrate Solution, nor when acidified with Nitric Acid by Silver Nitrate Solution. The *P.G.* includes a separate test for the presence of Iron, requiring that 20 c.c. of a 1–20 aqueous solution should not assume a blue coloration on the addition of 0·5 c.c. of Potassium Ferrocyanide Solution (1–20).

Volumetric Determination.—A weighed quantity of 1 gramme of the salt is thoroughly carbonised at a temperature not exceeding a red heat, the residue is treated with boiling Water, the solution filtered, and the extraction of the residue continued with boiling Distilled Water until the washings no longer produce an alkaline reaction with Methyl Orange T.S. The mixed filtrate and washings should require for complete neutralisation not less than 14·7 (14·74) c.c. of Semi-normal Volumetric Sulphuric Acid Solution, Methyl Orange T.S. being employed as an indicator of neutrality, *U.S.P.*

SODII THEOBROMINÆ ACETAS (Agurin) $C_7H_7N_4O_2Na\ C_2H_3O_2Na$, eq. 282·13.—A white, crystalline powder, possessing a somewhat bitter, saline taste. It is soluble in Water. Introduced as a diuretic.

It should be kept in well-closed glass bottles and protected as far as possible from exposure to the air, as it has a tendency to absorb Carbonic Anhydride.

It contains theoretically 63·8 p.c. of pure Theobromine, and shows a Theobromine content 10 p.c. in excess of that contained in Theobromine Sodium Salicylate.

Dose.—3 to 8 grains = 0·2 to 0·52 gramme, given in form of a cachet, or a suspension with mucilage.

Tests.—Theobromine Sodium Acetate dissolves in Water, forming a solution which is slightly alkaline in reaction towards red Litmus paper. The aqueous solution when neutralised and diluted with Hydrochloric Acid throws down a precipitate of Theobromine, which dissolves when shaken with Chloroform. If the chloroformic solution be separated and a few drops be evaporated to dryness on a water-bath on a watch-glass, the residue when treated with Chlorine Water and again evaporated to dryness on the water-bath leaves a reddish-brown residue which, when moistened with Ammonia Solution, affords a purple-violet coloration. An aqueous solution of the salt affords with Ferric Chloride T.S. a deep red coloration, which when boiled affords a brownish-red precipitate of basic Ferric Acetate. When heated with a small quantity of Sulphuric Acid and a little Alcohol (90 p.c.) it evolves a characteristic odour of Ethyl Acetate (Acetic Ether); the salt should leave no weighable residue when ignited with free access of air.

SODII ARSENAS.

ARSENIATE OF SODIUM (HYDROUS), *B.P.* '85.

Na_2HAsO_4, eq. 184·78.

FR., ARSÉNIATE DE SODIUM OFFICINAL; GER., NATRIUMARSENIAT; ITAL., ARSENIATO BISODICO; SPAN., ARSENIATO SODICO.

The anhydrous salt, Di-sodium Hydrogen Arsenate.

An odourless, white, granular, amorphous powder.

It should be kept in well-stoppered glass bottles and protected as far as possible from exposure to a moist atmosphere.

The anhydrous salt, Di-sodium Hydrogen Arsenate, is official in the *B.P.*, and is officially directed to be prepared by dehydrating the crystallised Di-sodium Hydrogen Arsenate at a temperature of 148·9° C. (300° F.). Crystallised Di-sodium Hydrogen Arsenate is prepared by crystallising from Water the product resulting from the fusion of Arsenious Anhydride with a mixture of Sodium Nitrate and Sodium Carbonate. Sodium Arsenate (*U.S.P.*) is the Di-sodium-ortho-arsenate containing 7 molecules of Water of crystallisation. Exsiccated Sodium Arsenate (*U.S.P.*) is the anhydrous or almost anhydrous Di-sodium-ortho-arsenate. The salt is not official in the *P.G.* The *Brussels Conference* has adopted the crystallised salt containing 7 molecules of Water of crystallisation.

The crystallised salt occurs as colourless, odourless, translucent, prismatic crystals, with a slightly alkaline reaction, having the formula $Na_2HAsO_4 \cdot 7H_2O$, eq. 309·94. The *B.P.* title 'Arseniate of Sodium' (hydrous), *B.P.* '85, might very well have been omitted, as it is very misleading, and apt to give rise to serious error if the terms are taken to be synonymous. Some mention of the equivalents of the two salts might at least have been made under this heading 1 grain of the anhydrous salt = 1·67 grains of the crystallised ($7H_2O$) salt; *not* 1·77 grains as given in the *B.P.* monograph on Liquor Sodii Arsenatis.

Solubility.—1 in 4 of Water.

Medicinal Properties.—Similar to those of Liquor Arsenicalis. *See* ACIDUM ARSENIOSUM, p. 14.

Dose.—$\frac{1}{40}$ to $\frac{1}{10}$ grain = 0·0016 to 0·0065 gramme.

Ital. maximum single dose of the crystals ($7H_2O$), 0·004 gramme maximum daily dose, 0·015 gramme.

Prescribing Notes.—*Generally employed in the form of the* **Liquor**; *may also be given in* **pills** *well triturated with Milk Sugar and 'Diluted Glucose,' q.s.*

Official Preparation.—Liquor Sodii Arsenatis.

Antidotes.—*See* ACIDUM ARSENIOSUM, p. 15.

Foreign Pharmacopœias.—Official in Belg., dried salt; Dutch, Fr., Ital., Mex., Port., Span. and Swiss, crystallised; Ital. and U.S. both.

Tests.—Sodium Arsenate dissolves readily in Water, forming a solution which possesses an alkaline reaction toward red Litmus paper. It answers the tests distinctive of Sodium given under that heading. The 5 p.c. aqueous solution affords with Barium or Calcium Chloride Solutions a white precipitate soluble in Nitric Acid; with Silver Ammonio-Nitrate Solution a dark red precipitate soluble in Nitric Acid; with Magnesium Ammonio-Sulphate Solution a white crystalline precipitate soluble in a diluted mineral acid. It is officially required to contain 99·8 p.c. of pure anhydrous Sodium Arsenate, as gravimetrically determined by precipitating a solution of a weighed quantity of 1 gramme of the salt and 1 (presumably gramme) of Glacial Acetic Acid in 50 c.c. of Water with Lead Acetate; the *B.P.* mentions that such a solution should require 2·03 grammes of the Lead salt for complete precipitation. The Report of the Committee of Reference in Pharmacy states that the Lead Acetate test, which has been several times the subject of discussion, is substantially correct if carried out as described in an Acid solution. The official volume does not state whether the 1 of Glacial Acetic Acid is by weight or by measure. The *U.S.P.*, although requiring that the salt should contain not less than 98 p.c. of anhydrous Di-sodium-ortho-arsenate, does not describe a method of determination. A volumetric process would have been preferable. A convenient method has been suggested (*Y.B.P.* '02, 505), the process recommends titrating a weighed quantity of the salt with Normal Volumetric Sulphuric Acid, using Methyl Orange Solution as an indicator of neutrality. Owing to the high molecular equivalent of the salt a good quantity should be employed for the determination, not less than 3 grammes of the crystallised or its equivalent of the anhydrous salt has been suggested.

The more generally occurring impurities are Lead, Copper and Iron, Aluminium, Calcium, Carbonates, Chlorides, Nitrates and Sulphates, a certain amount of moisture may also be present. 5 c.c. of a 1 in 20 aqueous solution of the salt when mixed with 1 c.c. of Ammonium Sulphide T.S. should not afford a dark coloration, indicating the absence of Lead, Copper and Iron. The aqueous solution when boiled with Ammonia Solution should not afford a white flocculent precipitate, indicating the absence of Aluminium; the aqueous solution should not yield on the addition of Ammonium Oxalate a white cloudiness or turbidity, indicating the absence of Calcium. The salt should not effervesce on the addition of a diluted mineral acid, indicating the absence of Carbonates. The aqueous solution when rendered acid with Nitric Acid should yield no pronounced turbidity on the addition of Silver Nitrate Solution or Barium Chloride Solution, indicating the absence of more than traces of Chlorides and Sulphates. When an aqueous solution of the salt is treated with Sulphuric Acid, the mixture being kept cool, it should yield no brown ring at the point of junction of the two liquids when Ferrous Sulphate Solution is poured upon the surface, indicating the absence of Nitrates. Arsenite is sometimes present as an impurity, and may be detected by the Silver Nitrate test given below. The *B.P.* requires that it should not lose weight on being heated to 148·9° C. (300° F.), indicating the absence of Hydrous Sodium Arsenate. The *U.S.P.* requires that it should not lose weight when heated to 150° C. (302° F.); the *B.P.* includes tests for Magnesium, Potassium and Ammonium.

Silver Nitrate.—If to 2 c.c. of an aqueous solution (1 in 20), 5 c.c. of Tenth-normal Silver Nitrate Volumetric Solution be added, and the precipitate redissolved by a slight excess of Ammonia Water, no black precipitate of reduced Silver should appear on boiling (absence of Arsenite), *U.S.P.*

Preparation.

LIQUOR SODII ARSENATIS. SOLUTION OF SODIUM ARSENATE. Sodium Arsenate, recently rendered anhydrous, 17½ grains; Distilled Water, *q.s.* to yield 4 fl. oz. (1 in 100)

After being made, this solution deposits a little Silica introduced in the preparation of the Arsenate, but, if filtered after a few days, remains clear.

It is about half the strength of Liquor Arsenicalis in Arsenic, as that preparation contains 1 p.c. of Arsenious Acid, and this 1 p.c. of Sodium Arsenate; another difference is that Liquor Arsenicalis contains an Arsenite, and this an Arsenate.

Dose.—2 to 8 minims = 0·12 to 0·5 gramme.

11 minims contain $\frac{1}{10}$ grain of the anhydrous salt.

Ph. Ger. maximum single dose, 0·5 gramme; maximum daily dose, 1·5 grammes, of the Potassium Arsenite Solution.

Foreign Pharmacopœias.—Official in U.S., same as Brit., Dan., Port. and Swiss, 1 in 500; Ital. and Mex. have Solucion Arsenical de Pearson, 1 in 600.

Tests.—Solution of Sodium Arsenate has a sp. gr. of 1·010 to 1·015. It is officially required to contain 1 p.c. w/v of anhydrous Sodium Arsenate, but no method is given by which this requisite percentage may be ensured. The *U.S.P.* requires that it shall contain Sodium Arsenate corresponding in amount to not less than 1 p.c. of exsiccated Sodium Arsenate, but like the *B.P.* gives no method by which this proportion may be ensured. It should respond to the tests distinctive of Sodium Arsenate given under Sodii Arsenas, and should be free from the impurities there mentioned.

SODII BENZOAS.

SODIUM BENZOATE.

C_6H_5COONa, eq. 143·01.

FR., BENZOATE DE SODIUM; GER., NATRIUMBENZOAT; ITAL., BENZOATO DI SODIO; SPAN., BENZOATO SODICO.

A white, odourless, amorphous powder or having a faint odour of Benzoin when made from resin-sublimed Acid. It is obtained by neutralising Benzoic Acid with Sodium Carbonate.

The salt is official in the *U.S.P.*, but not in the *P.G.* The *U.S.P.* requires that it shall contain not less than 99 p.c. of pure Sodium Benzoate.

It should be kept in well-stoppered glass bottles and in a cool atmosphere.

Solubility.—1 in 2 of Water; 1 in 25 of Alcohol (90 p.c.).

Medicinal Properties.—Similar to Benzoic Acid, but less irritating; given in chronic cystitis in which there is alkaline and decomposing urine.

The Royal College of Physicians of London recommended a solution of 120 grains in a quart of hot Water injected into the bowel in cholera; if much pain, 15 to 30 minims of Laudanum may be added.—*L.* '92, ii, 683.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

Prescribing Notes.—*May be given in* **cachets** *but generally employed in* **solution.**

Incompatibles.—Ferric Salts, Citric and Tartaric Acids, and Mineral Acids.

Foreign Pharmacopœias.—Official in all except Dan., Ger., Norw. and Swed. Dutch has also Benzoas Natricus cum Coffeino, Sodium Benzoate and Caffeine equal parts.

Tests.—Sodium Benzoate when heated melts, evolving an odour of Benzoic Acid, finally charring when strongly heated and leaving a residue which, when dissolved in Water, yields a solution having a strongly alkaline reaction towards red Litmus paper. The salt dissolves readily in Water, forming a colourless solution which possesses a faintly alkaline reaction towards red Litmus paper. The *U.S.P.* states that the aqueous solution is neutral or slightly alkaline towards Litmus paper. After separation of the Benzoic Acid it answers the tests distinctive of Sodium given under that heading. The aqueous solution of the salt affords with Ferric Chloride T.S. a buff coloured precipitate. A concentrated aqueous solution of the salt yields on the addition of sufficient Diluted Sulphuric Acid a bulky white crystalline precipitate, which when separated, washed till free from mineral acid and carefully dried should possess the m.p. and answer the tests distinctive of Benzoic Acid described under Acidum Benzoicum. It is officially required to yield from 97·2 to 98·7 p.c. of pure Sodium Benzoate as volumetrically determined by the process described below under the heading of Volumetric Determination. Three commercial samples contained an average of 4 p.c. of Water, which the volumetric test requiring 97 p.c. of anhydrous Sodium Benzoate does not recognise. The *U.S.P.* requires that it should contain not less than 99 p.c. of pure Sodium Benzoate as volumetrically determined by the process also mentioned in small type. It may be noticed that the Pharmacopœia leaves the choice of indicator to the operator. The *U.S.P.* states that Methyl Orange T.S. should be used as an indicator of neutrality. In carrying out the Pharmacopœia process of igniting a gramme of the salt, it will be found that considerable difficulty is experienced in burning off the carbonaceous matter, and the result is liable to be below the truth, owing to loss or incomplete washing of the partially incinerated residue. The method of direct titration similar to that given under Lithii Benzoas may be employed. 1 c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution is equivalent to 0·014301 gramme of Sodium Benzoate.

The more generally occurring impurities are heavy metals, Lead, Copper and Iron, Calcium, Ammonium, Carbonates, Chlorides or Sulphates. If the aqueous solution of the salt be slightly acidified with Diluted Hydrochloric Acid, and if the precipitated Benzoic Acid be separated by filtration, the filtrate should yield no darkening in colour when tested with Hydrogen Sulphide, either in the acidified filtrate as it stands, or after being rendered alkaline by the addition of Ammonia Solution, indicating the absence of Lead, Copper and Iron. The aqueous solution should afford no opalescence on the addition of Ammonium Oxalate Solution, indicating the absence of Calcium. When boiled with Potassium or Sodium Hydroxide Solution it shall not yield an ammoniacal odour, nor shall the issuing vapour possess an alkaline reaction towards moistened red Litmus paper, indicating the absence of Ammonium salts. The aqueous solution should not yield an effervescence on the addition of Diluted Sulphuric Acid, indicating the absence of Carbonate. If the aqueous solution be acidified with diluted Nitric Acid and filtered from the precipitate of Benzoic Acid, the filtrate should yield only the faintest turbidity with Silver Nitrate or Barium Chloride Solutions, indicating the absence of more than traces of Chlorides and Sulphates. The *B.P.* also includes tests for Magnesium and Potassium.

Volumetric Determination.—If 1 gramme of the dry salt be thoroughly ignited at red heat, and the residue extracted with boiling Distilled Water, until the washings cease to react with Methyl Orange T.S., the mixed filtrate and washings should require for complete neutralisation not less than 13·85 c.c. of Semi-normal Hydrochloric Acid Volumetric Solution, Methyl Orange T.S. being used as indicator, *U.S.P.*

The residue from the ignition of 1 gramme of the salt, when dissolved in Water should require for neutralisation 6·8 to 6·9 c.c. of the Volumetric Solution of Sulphuric Acid, *B.P.*

SODII BICARBONAS.

SODIUM BICARBONATE.

$NaHCO_3$, eq. 83·43.

FR., CARBONATE ACIDE DE SODIUM; GER., NATRIUMBICARBONAT;
ITAL., BICARBONATO DI SODIO; SPAN., BICARBONATO SODICO.

Small, opaque, prismatic crystals, or an odourless, white, microcrystalline powder, possessing a saline taste and alkaline reaction.

It should be kept in well-closed vessels and in a cool atmosphere.

Solubility.—1 in 12 of Water; insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Analogous to those of Potassium Bicarbonate; but it is much more frequently given, as it is only feebly depressant and is more slowly absorbed than the Potassium salt. Employed as a gastric sedative half an hour before food; and as an antacid in preventing the eructations and pain of hyperacidity half an hour after food. In the Uric Acid diathesis the corresponding salts of Potassium and Lithium are preferable, as they form more soluble salts with Uric Acid. Very large doses are given in the acid intoxication and coma of diabetes. Moistened with Water, it is an excellent application to the stings of wasps and gnats; a lotion relieves itching.

Alkalis are beneficial in dyspepsia when given half an hour before food, not, as is sometimes taught, by increasing gastric secretion, but by inhibiting it, and so for the time being resting the stomach.—(W. E. Dixon) *B.M.J.* '06, ii. 1459. Large doses the most successful treatment of acetonuria.—*L.* '07, i. 511.

Sodium salts accelerate the conversion of gelatinous Sodium Bi-urate into the crystalline variety, and their employment in the treatment of gout is apparently not desirable.—*L.* '00, i. 931; *B.M.J.* '00, i. 836.

5 cachets daily, each cachet containing 30 grains, increasing the dose if necessary, in the vomiting of pregnancy.—*Pr.* lxvii. 244.

Large doses (100 to 125 grains in 24 hours) in recurring vomiting of infancy. —*M.A.* '04, 379.

A sterile solution injected through a Eustachian catheter is probably the most efficacious treatment of non-suppurative middle-ear disease.—*B.M.J.* '04, ii. 1206.

120 to 180 grains per day in the recurrent vomiting of childhood.—*B.M.J.* '04, ii. 350, 351.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

Prescribing Notes.—*May be prescribed in* **cachets, powders,** *or in* **solution.** *It is also given in Compressed Tablets.*

20 *of Sodium Bicarbonate are neutralised by* 16·7 *of Citric Acid, and by* 17·8 *of Tartaric Acid.*

Official Preparation.—Trochiscus Sodii Bicarbonatis. Used in the preparation of Caffeinæ Citras Effervescens, Ferri Arsenas, Ferri Phosphas, Lithii Citras Effervescens, Magnesii Sulphas Effervescens, Pulvis Sodæ Tartaratæ Effervescens, Sodii Citro-Tartras Effervescens, Sodii Phosphas Effervescens, Sodii Sulphas Effervescens, Spiritus Ætheris Compositus, and 'Soluble Saccharin.'

Not Official.—Sal Emsanum Facticium, Trochisci Bicarbonatis Natrici Compositi, Collunarium Alkalinum, Collunarium Alkalinum Co., Mistura Sodæ Composita, Nebula Alkalina, and Nebula Alkalina Composita.

Foreign Pharmacopœias.—Official in all.

Tests.—Sodium Bicarbonate yields the tests distinctive of Sodium given under that heading. When heated it loses Carbon Dioxide and Water, being converted into Sodium Carbonate. It loses at a temperature of 100° C. (212° F.) (according to the *U.S.P.*) about 36·5 p.c. of its weight. According to the *P.G.*, 100 parts of the salt previously dried over Sulphuric Acid shall leave, after ignition at a dull red heat, not more than 63·8 parts by weight of residue, corresponding to a loss of not less than 36·2 p.c. It effervesces strongly on the addition of a diluted mineral acid, yielding a colourless and odourless gas which, when passed into Lime Water, yields a white precipitate soluble in a sufficient excess of the gas or in diluted mineral acids. The salt is soluble in Water, forming a colourless solution which is alkaline in reaction towards red Litmus paper; it yields no precipitate with Magnesium Sulphate Solution. It is officially required to indicate 98·4 to 99·3 p.c. of pure Sodium Bicarbonate as volumetrically determined by titrating 1 gramme of the salt with Volumetric Sulphuric Acid Solution, from 11·8 to 11·9 c.c. should be necessary; the choice of an indicator of neutrality is left to the operator. The *U.S.P.* requires that it should contain not less than 99 p.c. of pure Sodium Bicarbonate as volumetrically determined by titrating 2 grammes of the salt with Normal Volumetric Sulphuric Acid Solution, by the method indicated in small type below under the heading of Volumetric Determination. The *U.S.P.* directs the use of Methyl Orange Solution as an indicator of neutrality.

The more generally occurring impurities are Lead, Copper, Iron, Aluminium, Calcium, Ammonium, Chlorides, Sulphates, Thiocyanates, and Sodium Carbonate. The solution of the salt should afford no darkening in colour, either in acid or in alkaline solution, on the addition of Hydrogen Sulphide, indicating the absence of Copper, Lead, and Iron. Standards have been suggested (*C.D.* '08, i. 796) of 5 parts per million for Lead, and 2 parts per million for Arsenic. A standard suggested for Chloride is 0·1 p.c., calculated as Sodium Chloride. When dissolved in diluted Hydrochloric Acid, Ammonium Chloride added, and Ammonia Solution in faint excess, it shall yield no flocculent precipitate, indicating the absence of Aluminium. It should yield no opalescence on the addition of Ammonium Oxalate Solution to an aqueous solution slightly acidified with Acetic Acid, indicating the absence of Calcium. When heated in a dry test-tube it should not evolve an ammoniacal odour, nor should the vapour emitted possess an alkaline reaction towards moistened red Litmus paper. When the aqueous solution is acidified with Nitric Acid it should answer the test given under the heading of Silver Nitrate given below, and when the aqueous solution is saturated with Acetic Acid it should respond to the Barium Nitrate test described below, indicating the absence of Chlorides and Sulphates. The absence of Thiocyanates may be determined by the under-mentioned test with Ferric Chloride. The *B.P.* employs Mercuric Chloride T.S. as a means of distinguishing Sodium Carbonate from Sodium Bicarbonate. The test has been discarded by both the *U.S.P.* and the *P.G.* The *B.P.* requires that a solution of the salt in cold Water should give, with Mercuric Chloride T.S., a whitish precipitate, becoming brownish-red on standing; soluble Carbonates being stated in the Appendix to afford a brownish-red precipitate with Mercuric Chloride T.S. Howard has pointed out (*C.D.* '98, i. 675) that a pure sample will not pass the *B.P.* tests. Attfield (*Digest of Researches and Criticisms Report for* 1898) replies that the test is clearly not given as a 'pass' test of purity, but only as a 'distinction' test, and suggests that the critic missed an opportunity of recommending the addition of the following useful words to the official sentence: 'A solution of the salt in cold Water gives either no precipitate immediately or only a whitish precipitate, becoming reddish-brown on standing.' The *U.S.P.* and *P.G.* adopt practically the same method for determining the presence of the Normal Carbonate, which is described under the heading of Phenolphthalein in small type below. Traces of Sodium Carbonate, and also of Water, are probably present in all commercial Sodium Bicarbonates, but it may still pass the *B.P.* titration test, owing to the counterbalancing influence of the two impurities. The actual Carbonate may be estimated by adding an excess of Normal Volumetric Sodium Hydroxide Solution free from Carbonate, then an excess of Barium Chloride Solution, and titrating with Volumetric Sulphuric Acid Solution, using Phenolphthalein Solution as an indicator of neutrality. It has been recommended that the tests for Carbonate in the present official volume should be replaced by one on the lines of that in the *U.S.P.*, in the next revision. The *B.P.* includes, in addition to the above list of substances, Magnesium, Potassium, Sulphites and Thiosulphates as likely impurities, and requires that the salt should yield the customary no characteristic reaction with the tests for the three former and gives a test with Ferric Chloride Solution for the detection of the last named; no red coloration should be produced when the reagent is added to an aqueous solution acidified with Hydrochloric Acid.

Phenolphthalein.—A solution of 1 gramme of the salt in 20 c.c. of Water dissolved without agitation at a temperature not exceeding 15° C. (59° F.) should not be immediately coloured red by 3 drops of Phenolphthalein T.S., and any faint reddening produced should be discharged by 0·2 c.c. of Normal Volumetric Hydrochloric Acid Solution, *P.G.* The *U.S.P.* states that in such a solution a red tint should not be produced immediately on the addition of 0·2 c.c. of Normal Volumetric Hydrochloric Acid Solution and 2 drops of Phenolphthalein T.S.

Ferric Chloride.—5 c.c. of an aqueous solution (1 in 20) should not be coloured red by 1 drop of T.S. of Ferric Chloride, *U.S.P.*, also in *B.P.* and *P.G.*; the *B.P.* does not give quantities, and the *P.G.* uses a 1-50 solution acidulated with Nitric Acid.

Hydrogen Sulphide.—An aqueous solution of the salt (1-50) saturated with Acetic Acid should not be affected by T.S. of Hydrogen Sulphide, *P.G.* An aqueous solution (1-20) acidulated with Hydrochloric Acid should not respond to time-limit test for heavy metals, *U.S.P.*

Barium Nitrate.—An aqueous solution of the salt (1-50) saturated with Acetic Acid should be rendered not more than faintly opalescent by Barium Nitrate T.S. within 2 minutes, *P.G.*

Silver Nitrate.—An aqueous solution (1-50) acidulated with Nitric Acid should be clear and should not show more than a whitish opalescence within 10 minutes on the addition of T.S. of Silver Nitrate, *P.G.*

Volumetric Determination.—23·7 (23·74) c.c. of Normal Sulphuric Acid Volumetric Solution should be necessary to completely neutralise 2 grammes of the salt, Methyl Orange T.S. being used as indicator, *U.S.P.*

Preparations.

TROCHISCUS SODII BICARBONATIS.—Sodium Bicarbonate Lozenge.

Contain 3 grains in each, with Rose basis.

Dose.—1 to 6 lozenges.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr., Ital., Jap., Mex., Norw., Port., Russ., Span., Swiss and U.S.

SODII CITRO-TARTRAS EFFERVESCENS. Effervescent Sodium Citro-Tartrate.

Sodium Bicarbonate, 51; Tartaric Acid, 27; Citric Acid, 18; Refined Sugar, 15; all in powder; made into granules, the yield of which is about 100.

Dose.—60 to 120 grains = 4 to 8 grammes, as a mild, saline purgative.

Not Official.

SAL EMSANUM FACTICIUM.—Dried Sodium Sulphate, 7; Potassium Sulphate, 13; Sodium Chloride, 325; Sodium Bicarbonate, 655.—*Dutch.*

TROCHISCI BICARBONATIS NATRICI COMPOSITI.—Salis Emsani facticii, 25; Sugar, 75.—*Dutch.*

COLLUNARIUM ALKALINUM.—Sodium Bicarbonate and Borax, of each 3 grains; Phenol, 1 grain; White Sugar, 5 grains; Water, to 1 oz.—*Throat.*

COLLUNARIUM ALKALINUM CO.—Sodium Bicarbonate, Borax, Sodium Chloride, of each 2 grains; White Sugar, 5 grains; Water, to 1 oz.—*Throat.*

MISTURA SODÆ COMPOSITA.—Gentian Root, 5 grains; Rhubarb Root, 2 grains; Ginger, 1 grain; Sodium Bicarbonate, 10 grains; Peppermint Water, to 1 fl oz. Macerate the Gentian, Rhubarb and Ginger sliced, with the Sodium Bicarbonate in the Peppermint Water for 24 hours, then press out the liquor, strain, and pour Peppermint Water over the strainer until the product measures 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.* with the *syn.* Peacock's Stomachic Mixture.

NEBULA ALKALINA.—Sodium Bicarbonate, 15 grains; Borax, 15 grains; Carbolic Acid, 4 grains; Glycerin, 45 minims; Water, to 1 oz.—*Throat.*

Nebula Alkalina Composita.—Sodium Bicarbonate, 1·50; Borax, 1·50; Carbolic Acid, 0·75; Glycerin, 25; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

SODII BROMIDUM.

SODIUM BROMIDE.

NaBr, eq. 102·23.

FR., BROMURE DE SODIUM; GER., NATRIUMBROMID; ITAL., BROMURO DI SODIO; SPAN., BROMURO SODICO.

Minute white crystals, or a white crystalline powder, possessing a saline, slightly bitter taste. It may be prepared in a similar manner to Potassium Bromide, employing Sodium Hydroxide in place of Potassium Hydroxide.

As this salt is very deliquescent it should be kept in well-stoppered bottles. It may be prepared either anhydrous, or containing $2H_2O$.

Solubility.—5 in 6 of Water, and measures 7½; 1 in 16 of Alcohol (90 p.c.).

Medicinal Properties.—Similar to Potassium Bromide, but less depressant, and more easily tolerated by the stomach.

It has been recommended as a remedy for sea-sickness in 60-grain doses 3 times a day for at least 2 days before embarkation on a long voyage, the doses being reduced to half when on board.—*B.M.J.* '81, ii. 730.

Deprivation of salt and substitution of Bromide, about ½ oz. per week being taken in epilepsy.—*B.M.J.* '03, i. 552.

A nightly draught containing from 20 to 30 grains, together with a cachet containing 10 grains of Chloralamide, and followed by a second cachet containing 10 grains of Chloralamide if sleeplessness persists; in the treatment of insomnia accompanying the rapid heart of influenza.—*L.* '99, ii. 1079.

In the treatment of acute mania, 2 drm. in a half tumbler of Water every 2 hours until 1 oz. is given the first day, a similar amount given on the second day, and this may suffice to effect the result desired, which is not at its height until the fourth or fifth day, ceasing the administration for 24 hours, when drowsiness is so profound that the patient cannot be roused, or if when roused talk is incoherent.—*B.M.J.* '00, i. 134.

Given in the treatment of the Morphine, Chloral and Cocaine habits: 30 grains twice daily increasing the dose to 40, 50, 60, and even 120 grains if required.—*T.G.* '90, 600; 30 to 60 grains every 3 or 4 hours for a day or two.—*B.M.J.* '97, ii. 77; 120 grains in solution every 2 hours for the first 2 days, and 60 grains during the third day.—*B.M.J.* '99, i. 898.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

Prescribing Notes.—*Generally given in* **solution**; *it may be prescribed in* **powders** *if carefully wrapped in Tin foil. It is also given in* **Compressed Tablets** *and* **Effervescent Granules.**

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Norw., Russ., Span., Swed., Swiss and U.S.

Tests.—Sodium Bromide when heated melts, and when strongly heated volatilises slowly without decomposition. It answers the tests distinctive of Sodium given under that heading. It dissolves readily in Water, forming a clear solution which is neutral to Litmus, or only faintly alkaline in reaction towards red Litmus paper. The aqueous solution yields, on the addition of Silver Nitrate Solution, a yellowish curdy precipitate, practically insoluble in Ammonia Solution, insoluble in Nitric Acid, readily soluble in Potassium Cyanide Solution. With Chlorine Solution it affords a reddish coloration, which passes into chloroformic solution when shaken with that menstruum. A small portion of the salt, heated with Sulphuric Acid and a little Manganese Dioxide, evolves reddish vapours of Bromine, which impart an orange-yellow colour to Starch paper. It is officially required, when dry, to contain not less than 97·9 nor more than 99·98 p.c. of pure Sodium Bromide, as volumetrically determined by titration with Tenth-normal Volumetric Silver Nitrate Solution, as indicated below under the heading Volumetric Determination. The *U.S.P.* requires that it shall contain, when dried, not less than 97 p.c. of pure Sodium Bromide, as volumetrically determined by the method given in small type below. The *P.G.* requires that the salt dried at 100° C. (212° F.) shall contain not more than 100·6 p.c. of pure Sodium Bromide, as volumetrically determined by the process also given below.

The more generally occurring impurities are Arsenic, Lead, Copper, Iron and Zinc, Barium and Calcium, Ammonium, Carbonates, Cyanides, Bromates, Iodates, Chlorides, Iodides, Sulphates and Thiocyanates. Arsenic, Lead, Copper, Iron and Zinc may be detected by Hydrogen Sulphide, either in a solution rendered slightly acid or in a solution rendered faintly alkaline by Ammonia Solution. Barium may be detected by the test described below under the heading of Potassium Sulphate. The aqueous solution should afford no opalescence when tested with Ammonium Oxalate Solution, indicating the absence of Calcium. When boiled with Potassium Hydroxide Solution it should afford no ammoniacal odour, nor should the evolved vapours exhibit an alkaline reaction towards moistened red Litmus paper, indicating the absence of Ammonium salts. An aqueous solution of the salt should yield no effervescence on the addition of Diluted Hydrochloric Acid, indicating the absence of Carbonates, nor should an odour of Hydrocyanic Acid be noticeable when the acidified solution is gently warmed, indicating the absence of Cyanides. Bromates, if present, may be detected by the Sulphuric Acid test given in small type. The aqueous solution, when mixed with Potassium Iodide Solution and Tartaric Acid, should not yield a blue coloration on the addition of Starch Mucilage, indicating the absence of Iodate. If the aqueous solution be completely precipitated with Silver Nitrate Solution and the precipitate be treated with Ammonia Solution and filtered, the filtrate shall yield only a faint turbidity when acidified with Diluted Nitric Acid, indicating the absence of more than a trace of Chloride. Iodides, if present, may be detected by the test described under the heading of Chlorine Water and Chloroform given in small type. The aqueous solution should not afford a distinct turbidity on the addition of Barium Chloride Solution. The *P.G.* includes a separate test for Iron, which is described under the heading of Potassium Ferrocyanide in small type. The *B.P.* includes a test for Thiocyanates, requiring that Ferric Chloride T.S. should not cause a red coloration in an aqueous solution of the salt. It has been suggested (*P.J.* '01, i. 460) that the following modification of the Thiocyanate test should be made in the next revision of the *B.P.* A weighed quantity of a gramme of the salt dissolved in 10 c.c. of Water should give a yellow and not a red or reddish-brown coloration on the addition of 2 drops of Ferric Chloride T.S. (absence of more than 0·01 p.c. of Ammonium Thiocyanate). Neither the *U.S.P.* nor the *P.G.* includes a test for Thiocyanate.

Sulphuric Acid.—If diluted Sulphuric Acid be dropped upon some of the powdered salt no yellow colour should appear at once, *P.G.* and *U.S.P.*

Hydrogen Sulphide.—The aqueous solution of the salt (1–20) should not be affected by T.S. of Hydrogen Sulphide, *P.G.* The *U.S.P.* requires that such an aqueous solution slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals.

Phenolphthalein.—A solution of 1 gramme of the salt in 10 c.c. of Water and 0·1 c.c. of Tenth-normal Sulphuric Acid Volumetric Solution added should not yield any colour with a drop of Phenolphthalein T.S., even after boiling, *U.S.P.*

Potassium Sulphate.—10 c.c. of an aqueous solution (1–20) acidulated with Hydrochloric Acid should not be rendered turbid by 1 c.c. of T.S. of Potassium Sulphate, *U.S.P.* The *P.G.* requires that an aqueous solution (1–20) should not be affected by diluted Sulphuric Acid.

Potassium Ferrocyanide.—20 c.c. of an aqueous solution (1–20) previously acidulated with a few drops of Hydrochloric Acid should not be rendered blue by 0·5 c.c. of T.S. of Potassium Ferrocyanide, *P.G.*

Chlorine Water and Chloroform.—If to 10 c.c. of an aqueous solution of the salt (1 in 20) 1 c.c. of Chloroform be added, and then Chlorine Water which has been diluted with an equal volume of Water be cautiously introduced, drop by drop, with constant agitation, the liberated Bromine will dissolve in the Chloroform, imparting to it a yellow to orange colour, free from any violet tint, *U.S.P.*

Volumetric Determination.—Not less than 95·8 and not more than 97·8 c.c. of Silver Nitrate Volumetric Solution should be necessary for the complete precipitation of 1 gramme of the dry salt dissolved in Water, *B.P.*; 10 c.c. of an aqueous solution (3 grammes in 100 c.c.) of the salt, which has been dried at 100° C. (212° F.), should after the addition of a few drops of Potassium Chromate T.S. require not more than 29·3 c.c. of Tenth-normal Silver Nitrate Volumetric Solution to produce a permanent red colour, *P.G.*; a solution of 0·3 gramme of dried salt in 50 c.c. of Water with 2 drops of Potassium Chromate T.S. added should require not less than 28·5 nor more than 30 c.c. of Tenth-normal Volumetric Silver Nitrate Solution to produce a permanent red colour, *U.S.P.*

Rubidium Bromide in doses of 5 to 30 grains = 0·32 to 2 grammes; and **Rubidium Ammonium Bromide**, in doses of 10 to 40 grains have been introduced as substitutes for the alkaline Bromides in epilepsy.

Not Official.

SODII CACODYLAS.

$NaAs(CH_3)_2O_2$, eq. 158·96.

White, odourless crystals, or as a white, amorphous, deliquescent powder.

It may be obtained by exactly neutralising Cacodylic Acid with the quantity of Sodium Hydroxide indicated by titration with Normal Volumetric Sodium Hydroxide Solution. It may be prepared anhydrous, but the anhydrous salt is very deliquescent; as it usually exists commercially it contains 2 to 3 molecules of Water of crystallisation.

It should be kept in well-stoppered glass bottles and exposed as little as possible to the air, as it is of a deliquescent nature and readily absorbs moisture.

Solubility.—2 in 1 of Water, 1 in 1 of Alcohol (90 p.c.).

It has been recommended on account of its lesser toxicity in all cases where Arsenic is usually employed, *e.g.*, in tuberculous disease, anæmia, psoriasis and skin affections. It has also been used in the treatment of certain affections of the eye. When administered by the mouth in the form of pill or in solution it frequently imparts a disagreeable alliaceous odour to the breath, but when administered by hypodermic injection this objectionable feature is absent.

Professor Fraser has shown that when a salt of Cacodylic Acid is administered, it is absorbed and is eliminated, but the Arsenic it contains is so firmly combined that it does not become dissociated, and is therefore incapable of forming any compound in the body which can produce the well-known pharmacological activities of the usual therapeutic compounds of Arsenic. It has been found by Crocker to be a failure in skin diseases.—*B.M.J.* '02, i. 712; '02, ii. 656; *L.* '02, i. 748; '03, i. 785.

General references.—*L.* '00, ii. 1446, 1923; '01, i. 1462; '02, i. 676; *B.M.J.* '00, ii. 1823; '01, i. 120; *B.M.J.E.* '01, ii. 32, 48, 83; *P.J.* '00, ii. 724; '02, ii. 336, 697; *C.D.* '02, i. 59, 291, 466; *T.G.* '01, 790. Efficacious in yaws, *L.* '07, ii. 1459.

Foreign Pharmacopœias.—Official in Fr.

Tests.—Sodium Cacodylate melts at a moderately low temperature. It dissolves readily and completely in Water, forming a clear solution possessing a faintly alkaline reaction towards red Litmus paper. It yields no precipitate with Hydrogen Sulphide. It may be quantitatively determined by titration with Tenth-normal Volumetric Hydrochloric Acid Solution, using Methyl Orange Solution as an indicator of neutrality. Cacodylic Acid is in itself neutral in reaction towards Methyl Orange Solution, whilst the Sodium Cacodylate is readily decomposed by the Volumetric Hydrochloric Acid Solution. 1 c.c. of Tenth-normal Volumetric Hydrochloric Acid Solution corresponds to 0·015896 gramme of anhydrous Sodium Cacodylate. Occasionally commercial samples are found which contain free Cacodylic Acid, although there is no reason why, if carefully prepared, the resulting Cacodylate should not be neutral. In these cases, the free Cacodylic Acid may be determined by titration with Tenth-normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. 1 c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution is equivalent to 0·013708 gramme of pure Cacodylic Acid. The titration may then be continued with Tenth-normal Volumetric Hydrochloric Acid Solution, using Methyl Orange Solution as an indicator of neutrality. The number of c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution required to neutralise the free Cacodylic Acid should be deducted from the number of c.c. of Tenth-normal Volumetric Hydrochloric Acid Solution required for the total titration with Methyl Orange Solution, the difference being calculated into anhydrous Sodium Cacodylate. 1 c.c. of Tenth-normal Volumetric Hydrochloric Acid Solution corresponds to 0·015896 gramme of anhydrous Sodium Cacodylate. An aqueous solution of the salt when acidified with Nitric Acid should yield little or no turbidity on the addition of Silver Nitrate or of Barium Chloride Solution, indicating the absence of more than traces of Chlorides or Sulphates. It should not yield a precipitate on being rendered faintly alkaline with Lime Water, indicating the absence of Arsenic or Arsenious Acids and Oxalates. Cacodylates may be distinguished from Methylarsenates and the presence of traces of the former in the latter detected by the reaction with an acid solution of Hypophosphorous Acid, prepared by dissolving 20 grammes of Sodium Hypophosphite in 20 c.c. of Water and adding 200 c.c. of pure Hydrochloric Acid, a little Sodium Chloride crystallises out and may be separated by straining through absorbent Cotton-Wool. In applying the test 1 c.c. of a solution containing a trace of Cacodylate is added to 10 c.c. of the Acid Hypophosphite reagent, and the tube corked and allowed to remain at rest, an odour of Cacodyl will be developed after a time, even ½ mg. of Sodium Cacodylate giving a perfectly distinct odour in 12 hours, but no precipitate of Arsenic. In solutions containing larger quantities of Cacodylate a deposit of Arsenic is slowly formed on the sides of the tube. In the case of Methylarsenates no odour is evolved, the whole of the Arsenic in combination is precipitated at once.

INJECTIO SODII CACODYLATIS.—A sterilised solution, containing ¾ grain of pure Sodium Cacodylate in 17 minims. Also put up in glass capsules, each containing 1 c.c.

Elixir Sodii Cacodylatis.—An elixir, each fl. oz. of which contains ¾ grain pure Sodium Cacodylate.

Globules Sodii Cacodylatis.—Globules containing ¼ grain pure Sodium Cacodylate; also globules containing ⅛ grain.

ACIDUM CACODYLICUM. Cacodylic Acid. $HAs(CH_3)_2O_2$, eq. 137·08.

Tests.—Cacodylic Acid or Di-methyl Arsenic Acid melts at about 200° C. (392° F.). It dissolves readily and completely in Water, forming a clear solution which possesses an acid reaction towards Litmus paper and towards Phenolphthalein Solution. The acid is reduced to Cacodyl Oxide by Phosphorous Acid, and is converted into Cacodyl Sulphide by Hydrogen Sulphide in the presence of Water, but by dry Hydrogen Sulphide it is converted into Thio-cacodylic Acid. The alcoholic solution gives a precipitate with Alcoholic Mercuric Chloride Solution. It may be determined quantitatively by titration with Normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. 1 c.c. of Normal Volumetric Sodium Hydroxide Solution is equivalent to 0·13708 gramme of pure Cacodylic Acid. The aqueous solution when acidified with Nitric Acid should yield at the most but a faint turbidity with Silver Nitrate Solution, or with Barium Chloride Solution, indicating the absence of more than traces of Chlorides or Sulphates. When rendered faintly alkaline with Lime Water it should yield no decided turbidity or precipitate, indicating the absence of Arsenious or Arsenic Acids and Oxalates. When ignited with free access of air it should burn leaving no weighable residue.

FERRI CACODYLAS (Iron Cacodylate).—A yellow, or reddish-yellow, amorphous powder, soluble 1 in 15 of Water, insoluble in Alcohol (90 p.c.). Successful in anæmia.—*B.M.J.* '02, i. 713; *B.M.J.E.* '00, ii. 58; '02, ii. 87; *P.J.* '00, ii. 724; '03, i. 197.

Dose.—¾ to 5 grains by the mouth. 17 minims = 1 c.c. of the undermentioned solution hypodermically.

Tests.—Iron Cacodylate dissolves in Water, forming a clear solution which possesses an acid reaction towards blue Litmus paper. When ignited it leaves a residue consisting of Ferric Oxide which, when dissolved in Hydrochloric Acid containing a trace of Nitric Acid, yields the tests distinctive of Ferric salts given under Ferrum, p. 504. Commercial samples yield about 28·9 p.c. of Ferric Oxide on ignition. An alcoholic solution of Mercuric Chloride yields a yellow precipitate. The Iron Oxide should be also free from the impurities mentioned under Liquor Ferri Perchloridi Fortis, with the exception of Arsenic.

Injectio Ferri Cacodylatis.—A sterilised solution containing ¾ grain of Iron Cacodylate in 17 minims of solution. Also a double strength solution containing 1½ grains in 17 minims. Used with success in anæmia.

MAGNESII CACODYLAS (Magnesium Cacodylate).—A white, amorphou powder, readily soluble in Water. Employed for the same purpose as the Sodium compound.—*P.J.* '02, i. 123.

DI-SODII METHYLARSENAS. Di-sodium Methylarsenate. $Na_2CH_3AsO_3$, $6H_2O$, eq. 290·09.—Colourless translucent crystals, or masses of crystals, or as a white granular powder. Soluble 1 in 1½ of Water, insoluble in Alcohol (90 p.c.). Introduced as a comparatively non-toxic preparation of Arsenic, and employed in phthisis, in anæmias, and in malarial cachexia.—*L.* '02, i. 623; *B.M.J.* '02, i. 804; *B.M.J.E.* '02, i. 68; *P.J.* '02, i. 253, 256, 282.

Dose.—½ to 1 grain = 0·03 to 0·06 gramme in solution, hypodermically, or in pill form.

Though containing much Arsenic, practically an inert substance, and even in enormous quantities it was incapable of producing the well-defined pharmacological action, and the well-recognised toxic effects of the Arsenic ion, and also incapable of exerting the remedial or therapeutic influences which were those of the older and commonly used compounds of Arsenic.—*B.M.J.* '03, i. 428; *L.* '03, i. 304.

Non-toxic effect of organic Arsenic compounds demonstrated by Bunsen sixty years ago.—*L.* '03, i. 474.

Tests.—Di-sodium Methylarsenate dissolves readily in Water, forming a clear solution possessing a strongly alkaline reaction towards red Litmus paper. It may be determined quantitatively by titration with Tenth-normal Volumetric Sulphuric Acid, using Rosolic Acid Solution as an indicator of neutrality; in the event of free Methylarsenic Acid being present, it may be determined by first titrating with Tenth-normal Volumetric Sodium Hydroxide Solution, using a similar solution as an indicator. 1 c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution represents 0·013905 gramme of Methylarsenic Acid, the titration may then be continued with Tenth-normal Volumetric Acid Solution as above, deducting the number of c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution with Rosolic Acid Solution, the difference is calculated into terms of Di-sodium Methylarsenate. 1 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution represents 0·029009 gramme of Di-sodium Methylarsenate. It may also be determined by the much more intricate method of indirect Silver titration according to the method of Volhard. Di-sodium Methylarsenate may be distinguished from Sodium Cacodylate and the presence of a trace of the latter in an excess of the former by the Acid Hypophosphite reagent mentioned under Sodium Cacodylate. In performing the test it is only necessary to dissolve 0·2 of a gramme of the salt in 10 c.c. of the reagent, cork the tube and allow the mixture to stand for 12 hours, in the presence of even ½ mg. of Sodium Cacodylate a marked odour of Cacodyl will be evident.

The salt is also known under the commercial names of **Arrhenal** and **Arsinyl.**

Injectio Arsinyl.—A sterilised solution containing ½ grain of the pure salt in 17 minims.

Elixir Arsinyl.—An elixir containing ½ grain of the pure salt in 1 fl. drm.

ATOXYL is a white, odourless, crystalline powder, soluble 1 in 5 of Water, insoluble in Alcohol (90 p.c.). When originally introduced, the composition of Atoxyl was stated to be Met-arsenic Acid Anilide, but on account of the indifferent solubility of the salt, the Sodium salt of Met-arsenic Acid Anilide was introduced. It is not now believed to be an Aniline compound at all, but the Sodium salt of Para-aminophenylarsonic Acid. The *B.P.C.* mentions that Sodium Anilarsenate (*B.P.C.*) is also known under the trade name Atoxyl, but this statement is incorrect.

Dose.—¾ to 3 grains = 0·05 to 0·2 gramme. **Globules** = ½ grain (0·032 gramme) in each; **Elixir** = ½ grain (0·032 gramme) in each fl. drm. (3·6 c.c.); **Injection** = ½ grain (0·032 gramme) in 17 minims (1·0 c.c.).

A reference to this interesting compound, and the results of its action on trypanosomes, is recorded.—*B.M.J.* '05, i. 1142. The general conclusion formulated is that treatment with this compound is in many ways superior to the ordinary arsenical treatment, on account of the quicker but prolonged action of the drug on the parasite, the large doses which can be given without toxic symptoms, and the entire absence of any tendency to sloughing.

It is best administered intravenously in high doses and for a long period, pushing it to the maximal amount that the patient can stand without headache and nausea, at the same time building up the patient in every way possible that will conduce to a lessening of the anæmia.

A further reference to its use in trypanosomiasis.—*B.M.J.* '06, i. 1057. Inject subcutaneously in the form of a 20 p.c. solution in normal saline, in doses of 0·6 c.c. for 4 to 6 days, then increase the dose to 0·8 c.c. for 4 to 6 days, then to 1 c.c. per diem, continuing this dose until signs of intoxication begin to appear.

In trypanosomiasis, should be given as soon after infection as possible, and fresh solutions only must be used.—*L.* '08, i. 113.

Used with benefit in yaws (frambœsia) both as a curative and preventive.—*L.* '07, ii. 1459.

Complete recovery from malaria after 2 injections of 1·2 c.c. of 10 p.c. solution.—*B.M.J.E.* '07, ii. 52.

Leading article on its value in trypanosomiasis.—*B.M.J.* '07, ii. 1733.

In syphilis.—*B.M.J.* '07, i. 1458; but with caution.—*B.M.J.* '07, ii. 294.

A specific in psoriasis.—*L.* '07, i. 1151.

Results in trypanosomiasis by the Atoxyl and Mercury method distinctly encouraging.—*B.M.J.* '07, ii. 624, 685.

It is stated to be at least 20 times less toxic than Arsenic, at any rate when given hypodermically. The solution of Atoxyl is readily decomposed by acids, alkalis, and light. It should therefore be made up fresh every few days. The solution turns yellow or brownish, and whereas a fresh solution when injected causes no irritation, the solution used after it has been kept some days causes inconvenience and irritation, the syringe used should be sterilised by boiling and not be placed in any antiseptic. The practice in London is to commence with 1 grain, repeating the injections every second day, adding ½ grain more each time until a dose of 3 grains is reached, this being then continued. A few cases have had as much as 8 grains twice in a week. In Brussels the custom is to inject that quantity of fluid which contains 3 grains of Atoxyl on the first day, to repeat the injection on the fourth or fifth day, increasing the amount to 3¾ grains, and continuing the injection every third, fourth or fifth day, increasing each dose by ¾ grain until as much as 12 grains at a single dose is reached. Treatment of trypanosomiasis is continued for 2 or 3 months, after which an interval of 2 months is given, the series being then repeated. Atoxyl used in small doses, such as a grain twice a week to begin with and gradually increasing it, has been suggested in the treatment of leuchæmia, pernicious anæmia, Hodgkin's disease.—*The Hospital*, Sept. 21 '07, p. 657.

It has also been recommended (*B.M.J.* '07, ii. 685, 708) combined with Mercuric Chloride and Methylene Blue as a remedy for trypanosomiasis in veterinary work. A 1 p.c. aqueous solution of Methylene Blue prepared from a saturated Alcoholic solution is mixed with an equal quantity of a 1 in 500 aqueous solution of Mercuric Chloride. A dose of 10 c.c. is intravenously injected, and these intravenous injections have been repeated daily for 10 days.

Tests.—Atoxyl dissolves readily in Water, forming a clear solution which possesses a neutral reaction towards Litmus paper, its aqueous solution reduces Potassium Permanganate Solution and Gold Chloride Solution. It yields with Ferrous Sulphate Solution a green precipitate, with Bromine Water a white precipitate, and with Sodium Hypobromite Solution a blackish-red coloration.

SOAMIN. Sodium Para-aminophenylarsonate. $NaNH_2C_6H_5AsO_3\ 5H_2O$, eq. 326·82. Is an organic combination of Arsenic, of which it contains 22·8 p.c. It has been introduced for the treatment of syphilis and has been recently used with favourable results. It may be given by hypodermic injection, beginning with doses of 3 grains every third day and gradually raised to 10 grains every other day until a total of 100 grains has been given. As all the necessary physiological effects may be obtained with this dose it is not considered wise or necessary to push it any higher; the preparation should not be given by the mouth.—*B.M.J.* '08, ii. 393.

SODII CARBONAS.

SODIUM CARBONATE.

$Na_2CO_3, 10H_2O$, eq. 284·11.

Fr., Carbonate Neutre de Sodium Cristallisé Officinal; Ger., Natrium-carbonat; Ital., Carbonato di Sodio; Span., Carbonato Sodico Cristalizado.

Colourless, translucent, efflorescent, monoclinic crystals, possessing a somewhat caustic taste and an alkaline reaction. Sodium Carbonate (*B.P.*) contains 10 molecules of Water of crystallisation. The Sodium Carbonate official in the *U.S.P.* is mono-hydrated Sodium Carbonate containing 1 molecule of Water of crystallisation. The Sodium Carbonate (*P.G.*) is similar to the British and contains 10 molecules of Water of crystallisation.

It should be kept in well-closed vessels, as it has a tendency to effloresce on exposure to dry air.

Solubility.—5 in 8 of Water at 60° F., and measures 11; 12 in 1 of Water at 100° F.; almost insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Antacid; but it is so apt to irritate that the Bicarbonate is almost invariably preferred. Externally, as a lotion (30 grains to a pint) in eczema.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

Prescribing Notes.—*The* **Exsiccated salt** *may be given in the form of* **pills** *massed with 'Diluted Glucose.'*

143 grains of the crystallised salt are equal to nearly 53 grains of the **Exsiccated** *salt.*

20 of Sodium Carbonate are neutralised by 9·8 of Citric Acid, and by 10·5 of Tartaric Acid.

Official Preparation.—Sodii Carbonas Exsiccatus used in the preparation of Extractum Ergotæ and many Sodium salts; also Liquor Magnesii Carbonatis and various Carbonates, etc. The **Exsiccated Carbonate** is used in the preparation of Pilula Ferri.

Not Official.—Balneum Alkalinum, Bain Alcalin.

Foreign Pharmacopœias.—Official in all.

U.S. has only Sodii Carbonas Monohydratus.

Tests.—Sodium Carbonate when heated liquefies, loses its Water of crystallisation amounting to 62·93 p.c. and leaves a white anhydrous salt. The *U.S.P.* salt when heated to 100° C. (212° F.) loses its Water of crystallisation, equivalent to 14·52 p.c. The *P.G.* states that 100 parts of the salt contain 37 p.c. of anhydrous Sodium Carbonate. On the addition of diluted Hydrochloric Acid it effervesces, giving off a colourless gas, which when passed into Lime Water yields a white precipitate soluble in a sufficient excess of the gas, and also soluble in a diluted mineral acid with effervescence. The resulting solution answers the tests distinctive of Sodium given under that heading. The *B.P.* requires that, with the exception of the Mercuric Chloride Solution test, it should answer the qualitative tests given under Sodii Bicarbonas. An aqueous solution is required to immediately yield a brownish-red precipitate on the addition of

Mercuric Chloride Solution. It is presumably intended that the Magnesium Sulphate Solution test should also be excluded, for it may safely be taken that the words 'it should afford the reactions characteristic of Sodium and of Bicarbonates' apply to the qualitative tests for the latter. Sodium Carbonate dissolves readily in Water, yielding a clear solution which possesses a strongly alkaline reaction towards red Litmus paper. It is officially required to yield at least 98·01 p.c. of pure crystallised Sodium Carbonate, equivalent to 43·23 p.c. of pure anhydrous Sodium Carbonate as determined by titration with Volumetric Sulphuric Acid Solution. The mono-hydrated Sodium Carbonate of the *U.S.P.* is required to contain not less than 85 p.c. of pure anhydrous Sodium Carbonate, corresponding to not less than 99·5 p.c. of the crystallised mono-hydrated salt. The *P.G.* requires that it shall contain not less than 100·2 p.c. of pure crystallised Sodium Carbonate. The *B.P.* and *P.G.* methods of determination will be found in the small type below under the heading of Volumetric Determination. It will be observed that neither the *B.P.* nor the *P.G.* mentions a suitable indicator of neutrality. The *U.S.P.* requires that Methyl Orange Solution shall be used.

The more generally occurring impurities are such as are also found in the Bicarbonate, it may also contain Arsenic as an impurity. The tests given for the detection of the impurities under Sodii Bicarbonate may also be employed here; the modified Gutzeit's test may also be used for the detection of Arsenic. Standards have been suggested (*C.D.* '08, i. 796) of 10 parts per million for Lead and 2 parts per million for Arsenic. A standard suggested for Chloride is 0·1 p.c., calculated as Sodium Chloride.

Hydrogen Sulphide.—An aqueous solution (1–20) should not be affected by Hydrogen Sulphide T.S. either before or after acidulation with Acetic Acid, *P.G.*

Barium Nitrate.—An aqueous solution (1–20) acidulated with Acetic Acid should not be affected by T.S. of Barium Nitrate, *P.G.*

Silver Nitrate.—An aqueous solution (1–20) with excess of Nitric Acid should not give more than a whitish opalescence within 10 minutes with T.S. of Silver Nitrate, *P.G.*

Sodium Hydroxide.—Warmed with Sodium Hydroxide T.S. the salt should not evolve Ammonia, *P.G.*

Volumetric Determination.—6·9 c.c. of Sulphuric Acid Volumetric Solution should be necessary to neutralise 1 gramme of the salt, *B.P.* Not less than 7 c.c. of Normal Volumetric Solution of Hydrochloric Acid, *P.G.*

Preparation.

SODII CARBONAS EXSICCATUS. Na_2CO_3, eq. 105·31. EXSICCATED SODIUM CARBONATE. DRIED CARBONATE OF SODIUM.—*B.P.* '85.

A white, amorphous, odourless powder, obtained by heating crystallised Sodium Carbonate until it loses 63 p.c. of its weight.

Dried Sodium Carbonate is not official in the *U.S.P.* The mono-hydrated salt being the only one adopted. The dried salt is official in the *P.G.*, but it does not correspond to the completely dehydrated salt of the *B.P.*, as it is prepared by drying coarsely-powdered Sodium Carbonate at a temperature not exceeding 25° C. (77° F.) until completely effloresced, protecting it from the dust, then at a temperature from 40° to 50° C. (104° to 122° F.) until it has lost half of its original weight. The official salt is obtained by heating Sodium Carbonate (temperature not stated) until it loses nearly 63 p.c. of its original weight, as stated above.

53 grains are equal to nearly 143 grains of crystallised salt.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme.

Foreign Pharmacopœias.—Official in Austr., Dan., Fr., Ger., Hung., Jap., Russ., Span., Swed. and Swiss.

Tests.—Dried Sodium Carbonate answers the tests distinctive of Sodium and of Carbonates given under the heading of Sodii Carbonas. Beyond the facts that it is required by the *B.P.* to yield not more than traces of Water when strongly heated, and that it is directed to be prepared as above, no indication is given of the requisite quantity of anhydrous Sodium Carbonate which it should contain. No method of determination is given in the *B.P.* The *P.G.* requires that on the titration of a weighed quantity of 1 gramme of the dried Sodium Carbonate with Normal Volumetric Hydrochloric Acid, not less than 14 c.c. should be required for neutralisation. It should be free from the impurities mentioned under Sodium Bicarbonate, and also under Sodium Carbonate. It has been recommended that a limit of Water should be allowed and definitely stated.

Not Official.

BALNEUM ALKALINUM.—Crystals of Sodium Carbonate, 8 or 10 oz. to 60 gallons of Water.

Used in scaly skin diseases.

BAIN ALCALIN.—Crystallised Sodium Carbonate of commerce, 250 grammes dissolved in 1000 c.c. of Water and added to a bath.—*Fr.*

SODII CHLORIDUM.

SODIUM CHLORIDE.

NaCl, eq. 58·07.

FR., CHLORURE DE SODIUM OFFICINAL; GER., NATRIUMCHLORID; ITAL., CLORURO DI SODIO; SPAN., CLORURO SODICO.

White, cubical crystals, or a white, crystalline powder, possessing a strong, saline taste, and neutral reaction. It is prepared by purifying common salt.

Solubility.—1 in 2¾ of Water; 1 in 2¾ of boiling Water; 1 in 200 of Alcohol (90 p.c.).

Medicinal Properties.—In small doses, stimulant and tonic; in larger doses, purgative and emetic; in the form of enema, anthelmintic. It is an important article of diet. A pint or more of **Normal Saline Solution** is injected intravenously, subcutaneously, or into the rectum, according to urgency, in shock or collapse due to hæmorrhage, and in uræmia, eclampsia and cholera. Locally, as a fomentation to sprains and bruises. Salt water baths (1 lb. to 4 gallons) are tonic and stimulant, especially in children, and are useful in chronic rheumatism and gout. Nasal injection of a saturated solution is useful in ozœna. A recent cold is greatly relieved by douching the nostrils and gargling the throat with a weak solution of Salt; gargling is also serviceable in tonsillitis and chronic throat catarrh. In case of a leech being swallowed a strong solution of Salt should be drunk; it is also a valuable antidote in poisoning by Silver Nitrate.

Its value as an article of diet is well known. Soldiers are supplied with it: our army, 0·5 oz. daily; the French, 0·5; Prussian, 0·87; Russian, 1·86; for a long time the Russian soldiers had salt-money given, and it was only when scurvy attacked them that the money was stopped and the salt given instead.

Irrigation of the urethra with hot saline solution in treatment of gonorrhœa. —*B.M.J.E.* '01, ii. 60.

Saline transfusion for prevention of shock during prolonged operations.—*B.M.J.* '01, ii. 1139.

Intravenous injection of normal saline solution in a severe case of hæmatemesis; recovery.—*B.M.J.* '02, i. 770.

Since it is shown conclusively that a liberal allowance of salt may intensify the ascites, a diet relatively poor in Chlorides must be considered a useful therapautic measure in such cases. Good effects have been witnessed (*Pr.* lxxxiii. 699) from a cure by dechlorination in cases of ascites due to tubercular peritonitis, in pleurisy with effusion, and phlegmasia alba dolens.

In desperate cases of hæmorrhage the subcutaneous transfusion of saline fluid should be practised, as it can be done without disturbing the patient.—*B.M.J.* '05, i. 68.

Many of the symptoms, such as rigors and sweating, which are occasionally seen after intravenous transfusion of a solution of Sodium Chloride, are due to the chemical composition of the fluid being incorrect.—*L.* '05, i. 847.

Bearing on this statement, it appears (*B.M.J.* '04, ii. 1198) that the proper strength for normal saline solution is 0·9 p.c.

In collapse following severe hæmorrhage, intravenous transfusions with physiological salt solution should be performed as soon as possible.—*L.* '05, i. 854. 1 to 10 oz. of normal saline injected at one spot, the fluid being allowed to enter slowly, in the treatment of collapse following the great loss of fluid caused by diarrhœa of infants.—*Pr.* lxxiv. 508. A case of fatal poisoning caused by injecting 500 c.c. of an almost saturated solution from a stock bottle instead of the usual 0·9 p.c. solution.—*L.* '05, ii. 176. Subcutaneous injection of 100 to 300 c.c. of Atlantic sea water, reduced by dilution to isotonism with the blood, every 3 or 4 days in tuberculosis.—*M.P.* '05, ii. 383. Half a pint of normal saline solution injected twice daily in the treatment of congenital hypertrophic stenosis of the pylorus.—*L.* '05, ii. 503.

The injection of saline fluids may afford much assistance in surgical shock, but this fluid is expelled into the tissues more quickly the more profound the degree of shock, and the effect is therefore temporary and of no use whatever except to gain time, which may allow the superficial vessels to be made to relax or to relax spontaneously. In this way saline injections may make all the difference between losing and saving a patient's life.—*L.* '05, ii. 578.

Injection of normal saline is stated (*B.M.J.E.* '05, ii. 20) to show a superiority over other plans of treatment in delirium tremens.

In the treatment of puerperal eclampsia as an intercellular transfusion, the solution used contains 1 drm. each of Sodium Chloride and Sodium Acetate to a pint of Water. The solution is sterilised, and at 100° F. (37·7° C.) is run into the areolar tissue beneath the breast or after delivery into the lax abdominal wall.—*B.M.J.* '05, ii. 1635; *L.* '01, i. 1682; *B.M.J.* '01, i. 510, 958, 1144; '03, 1023; '03, ii. 1332, 1378, 1408; *T.G.* '01, 616, 623.

General formulas for saline solutions.—*Pr.* lxvii. 486; *P.J.* '99, ii. 141.

In pneumonia.—*B.M.J.* '00, ii. 900.

In diabetic coma.—*B.M.J.* '03, i. 544.

Dose.—10 to 60 grains = 0·65 to 4 grammes, as a tonic; as an emetic, ½ to 1 oz. = 14·2 to 28·4 grammes.

Official Preparation.—Used in the preparation of Acidum Hydrochloricum, Hydrargyri Perchloridum, Hydrargyri Subchloridum, Sodii Bicarbonas and Sodii Sulphas.

Not Official.—Normal Saline Solution, Pulvis Salinus Anticholeraicus and Nebula Sodii Chloridi Composita.

Foreign Pharmacopœias.—Official in Austr. Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Sodium Chloride when heated decrepitates and at a red heat fuses. It dissolves readily in Water, forming a clear solution which is neutral in reaction towards Litmus paper and which yields the tests distinctive of Sodium given under that heading. It also yields on the addition of Silver Nitrate Solution a white curdy precipitate insoluble in Nitric Acid, readily soluble in Ammonia Solution and reprecipitated on acidification with Nitric Acid. When mixed with Sulphuric Acid it evolves Hydrochloric Acid gas, which immediately reddens a piece of moistened blue Litmus paper. When heated with Manganese Dioxide and Sulphuric Acid it evolves a yellowish gas, which first reddens and then bleaches a piece of moistened blue Litmus paper, and which instantly liberates Iodine from Potassium Iodide Solution, recognisable by the blue colour which it produces with Mucilage of Starch. Neither the *B.P.* nor the *P.G.* includes a requisite percentage of pure Sodium Chloride nor a method for its quantitative determination. The *U.S.P.* requires that the salt when dried should contain not less than 99 p.c. of pure Sodium Chloride as volumetrically determined by the method given in small type below under the heading of Volumetric Determination.

The more generally occurring impurities are Calcium and Magnesium, Bromides, Iodides and Sulphates. The *B.P.* includes also Potassium as a likely impurity. Calcium and Magnesium, if present, may be detected by the test with Ammonium Oxalate and Sodium Phosphate. Bromides or Iodides, if present, may be detected by the test with Chlorine Water given below under that heading. Sulphates by the test with Barium Nitrate Solution given under the heading of Barium Nitrate. The *P.G.* includes a separate test for Iron with Potassium Ferrocyanide Solution; the *U.S.P.* tests for Arsenic, Copper, Lead, Iron and Zinc by means of the time-limit test with Hydrogen Sulphide. Each of these tests is described below under the headings Potassium Ferrocyanide and Hydrogen Sulphide. Standards have been suggested (*C.D.* '08, i. 796) of 10 parts per million for Lead, and 1 part per million for Arsenic.

Hydrogen Sulphide.—An aqueous solution (1–20) of the salt should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Barium Nitrate.—An aqueous solution (1–20) of the salt should not be affected by T.S. of Barium Nitrate, *P.G.*

Sulphuric Acid.—An aqueous solution (1–20) of the salt should not be affected by diluted Sulphuric Acid, *P.G.*

Ammonium Oxalate.—An aqueous solution (1–20) after the addition of Ammonia T.S. should not be affected by T.S. of Ammonium Oxalate, *P.G.*

Sodium Phosphate.—An aqueous solution (1–20) after the addition of Ammonia T.S. should not be affected by T.S. of Sodium Phosphate, *P.G.*

Potassium Ferrocyanide.—20 c.c. of an aqueous solution (1–20) should not be rendered blue by 0·5 c.c. of T.S. of Potassium Ferrocyanide, *P.G.*

Chlorine Water.—If 2 grammes of the finely powdered salt be digested for some hours with 25 c.c. of warm Alcohol and, after cooling, the undissolved salt be removed by filtration, the filtrate evaporated to dryness, and the residue dissolved in 5 c.c. of Water, and if 1 c.c. of Chloroform be added, and Chlorine Water which has been diluted with twice its volume of Water, cautiously introduced, drop by drop, with constant agitation, the Chloroform should not acquire a violet, yellow, or orange colour, *U.S.P.*

Volumetric Determination.—If 1 gramme of well dried Sodium Chloride be dissolved in sufficient Distilled Water to measure 100 c.c., and 10 c.c. of the solution be mixed with a few drops of Potassium Chromate T.S., it should require not less than 17 (17·05) c.c. of Tenth-normal Volumetric Silver Nitrate Solution to produce a permanent red colour, *U.S.P.*

Not Official.

NORMAL SALINE SOLUTION (also called Physiological Salt Solution).—Sodium Chloride, 78·75 grains; boiled and cooled Water, to 20 fl. oz. (or in any case, sterilised).

On the authority of Professor Stirling, of Manchester, the percentage of Sodium Chloride in human blood is taken to be 0·9 p.c. The usual figure 0·6 p.c. is for cold-blooded animals, and was calculated on the blood of a frog.

Solutions the osmotic pressure of which is the same as that of blood plasma, are said to be isotonic with the blood. If a solution the osmotic pressure of which is markedly less than that of blood plasma be used, many of the red corpuscles may be destroyed. The salt in greatest amount in the plasma is Sodium Chloride, and therefore in making isotonic solutions this salt is generally used. A solution containing 0·9 p.c. Sodium Chloride gives the same osmotic pressure as plasma, and is therefore isotonic with the blood.

PULVIS SALINUS ANTICHOLERAICUS (*Stevens*).—Sodium Bicarbonate, 30 grains; Sodium Chloride, 20 grains; Potassium Chlorate, 7 grains; for 1 dose.

Given frequently in a small tumbler of Water in diarrhœa and cholera.

NEBULA SODII CHLORIDI COMPOSITA.—Sodium Chloride, 1; Sodium Bicarbonate, 1; Borax, 1.

1 teaspoonful to be dissolved in a pint of warm Water, and used as a spraying solution.—*University.*

Sodium Bicarbonate, 1·50; Sodium Chloride, 0·75; Borax, 1·50; Distilled Water, warm, *q.s.* to produce 100.—*B.P.C.*

Not Official.

SODII CINNAMAS.

SODIUM CINNAMATE.

Na $C_9H_7O_2$, eq. 168·83.

A white, granular, amorphous powder, having a faint cinnamon-like odour, and a faintly alkaline reaction. Soluble 1 in 11 of Water, 1 in 160 of Alcohol (90 p.c.). It has been used in phthisis and in cancer, as an intramuscular or intravenous injection (15 to 30 minims of a 10 or 20 p.c. aqueous or Glycerin solution). In ophthalmic surgery it has been employed in the form of a 1 p.c. (7 to 8 minims) aqueous solution by subconjunctival injection.—*L.* '02, ii. 66, 67, 1755; *B.M.J.E.* '01, i. 67; '02, i. 28; *P.J.* '02, i. 550; *C.D.* '02, ii. 155.

In tuberculosis, commencing with doses of 1 mg. = $\frac{1}{10}$ c.c. of a 1 p.c. solution, increasing the dose by $\frac{1}{2}$ to 1 mg. until 10, 15, or even 20 mg. are reached; the injections being given 3 times a week.—*B.M.J.E.* '04, i. 71.

Though not a specific, it is a useful adjunct to treatment of tuberculosis. Dose, 20 to 50 mg. (maximum). Leucocytosis produced by about 20 mg.—*L.* '04, ii. 1136; *B.M.J.E.* '05, i. 24.

In the treatment of cancer it is administered once or twice a week in the form of a 10 p.c. Glycerin solution in doses of 30 minims (1·8 c.c.) hypodermically. The hypodermic use of a 22 p.c. aqueous solution of Sodium Orthocoumarate in doses of 25 minims (1·5 c.c.), administered at the same interval, is also referred to.—*B.M.J.* '05, i. 927.

In a plea for more extended use of treatment by hypodermic injection a reference is made (*L.* '05, i. 1340) to the successful employment of this salt by Landerer in 1893 in the treatment of pulmonary tuberculosis.

A further reference to the use of these salts in cancer, and to a serum prepared from tuberculous horses after repeated injections with Sodium Cinnamate, is in *L.* '05, ii. 393.

An interesting point concerning the solubility of this salt and the preparation of the solution is dealt with in a paper on Solubility appearing in the *P.J.* [4], 20, 786; *C.D.* '05, ii. 783.

The most active chemical substance examined was Cinnamic Aldehyde; its administration is, however, exceedingly painful, and had to be temporarily abandoned.

Although the correct figure for the solubility of this salt is 1 in 11, a clear solution may be prepared by the aid of heat of a strength of 1 in 10, but it requires very careful handling, and the friction of the stopper of the bottle is very often sufficient to cause the salt to crystallise out. For hypodermic use the solution should be a little weaker than 10 p.c. Some authorities have claimed that a clear permanent 10 p.c. solution may be prepared in absolute Glycerin, but this is contrary to our experience. The solution, though clear when first prepared, develops crystals in the course of a few days, and the specimens before us now are practically a solid mass of crystals. The salt has assumed importance owing to its hypodermic employment in pulmonary tuberculosis and cancer. Having had a large number of these solutions to prepare, this experience of the behaviour of the salt may prove useful to others.

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

It was introduced commercially as **Hetol.**

Tests.—Sodium Cinnamate when heated yields an aromatic odour somewhat resembling Bitter Almonds, and when ignited with free access of air leaves a more or less blackish residue which when dissolved in Water possesses a strong alkaline reaction towards red Litmus paper, and which effervesces on the addition of a diluted mineral acid.

The salt dissolves in Water, yielding a clear solution which is neutral in reaction towards Litmus paper. An aqueous solution yields with Ferric Chloride T.S. a yellow precipitate, and a white precipitate with Manganese Chloride Solution, which soon becomes crystalline. If the aqueous solution be sufficiently concentrated it yields on acidification with Diluted Sulphuric Acid a white crystalline precipitate soluble in Ether. If the ethereal solution be separated, washed till free from mineral acid and evaporated spontaneously, it yields a crystalline residue which should possess a m.p. of about 132° C. (269·6° F.), the aqueous portion remaining after the removal of the precipitated acid will answer the tests distinctive of Sodium given under that heading. When oxidised with Potassium Permanganate it yields an odour of Benzaldehyde. The amount of pure Sodium Cinnamate contained in a specimen may be quantitatively determined by titration with Tenth-normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as an indicator of neutrality, sufficient Ether should be added to hold the liberated Cinnamic Acid in solution during the titration, and to prevent it masking the end reaction. 1 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution corresponds to 0·016883 gramme of pure anhydrous Sodium Cinnamate. Free Cinnamic Acid, if present, may be determined, previous to the above volumetric determination, by titrating with Tenth-normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. Each c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution used corresponding to 0·014695 gramme of absolute Cinnamic Acid. In the event of free Cinnamic Acid being present, the number of c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution required to neutralise this free Cinnamic Acid must be deducted from the total number of Tenth-normal Volumetric Sulphuric Acid Solution required to complete the titration with Methyl Orange Solution before the result is calculated into terms of Sodium Cinnamate. The aqueous solution when acidified with diluted mineral acids, though affording a white crystalline precipitate, should yield no effervescence, indicating the absence of Carbonates. If the aqueous solution be acidified with diluted Nitric Acid, and the liberated Cinnamic Acid be separated by filtration, the filtrate should yield at the most but a slight turbidity with either Silver Nitrate Solution or Barium Chloride Solution, indicating the absence of Chlorides and Sulphates.

Hetol-Caffeine (Caffeine Sodium Cinnamate).—An amorphous, bitter powder; **Heto-Cresol** (Meta-cresolic Ester of Cinnamic Acid) and **Hetoform** (Bismuth Cinnamate) are compounds which have received notice in medical literature.

INJECTIO SODII CINNAMATIS.—A sterilised 10 p.c. aqueous solution of Sodium Cinnamate.

Dose.—16 minims = 1 c.c., hypodermically.

Glycerin has been recommended as a solvent for Sodium Cinnamate. The solution can be readily sterilised, but a 10 p.c. solution, though bright when first made, soon crystallises out.

This suggestion has been incorporated in the *B.P.C.* in the form of **Glycerinum Sodii Cinnamatis,** Sodium Cinnamate, 5; Glycerin, 95.

Not Official.

SODII CITRAS.

SODIUM CITRATE.

$Na_3C_6H_5O_7, 5\frac{1}{2}H_2O$, eq. 354·60.

A white, granular powder, possessing a cool, saline taste and a faint, caramel-like odour.

It should be kept in well-closed bottles, as it has a tendency to slowly effloresce on exposure to dry air. It dissolves 5 in 9 of Water, insoluble in Alcohol (90 p.c.), and in Ether.

Tests.—Sodium Citrate when heated loses its Water of crystallisation; when heated to dull redness it is decomposed, and on ignition leaves a carbonaceous residue which, when dissolved in Water, possesses a strongly alkaline reaction. This residue effervesces on the addition of diluted Hydrochloric Acid, and yields a solution giving the tests distinctive of Sodium mentioned under that heading. The salt dissolves readily and completely in Water, forming a clear solution slightly alkaline in reaction towards red Litmus paper, and which should not be coloured red by a drop of Phenolphthalein Solution. The aqueous solution affords upon boiling with Calcium Chloride Solution a white granular precipitate, insoluble in Potassium Hydroxide but soluble in Ammonium Chloride Solution. The *U.S.P.* requires the salt to contain not less than 97 p.c. of pure crystallised Sodium Citrate as volumetrically determined by the titration of the solution of the alkaline residue left on ignition. A weighed quantity of the salt is thoroughly charred at a dull red heat, the residue extracted with boiling Water till the washings fail to react with Methyl Orange T.S., and the mixed filtrate and washings are titrated with Semi-normal Volumetric Sulphuric Acid Solution, employing the above indicator to ascertain the point of neutrality; not less than 16·4 c.c. of the Semi-normal Volumetric Sulphuric Acid Solution should be necessary.

The more generally occurring impurities are Arsenic, Copper, Lead, Iron, Zinc and Carbonates. Arsenic, if present, may be detected by the modified Gutzeit's test. A 5 p.c. w/v aqueous solution of the salt should neither yield a distinct coloration nor turbidity on the addition of Hydrogen Sulphide to the solution acidified with diluted Hydrochloric Acid, nor a decided coloration or turbidity when the solution is subsequently made alkaline with Ammonia, indicating the absence of Copper, Lead, Iron and Zinc. A 1 in 20 aqueous solution of the salt should not yield an effervescence on the addition of a mineral acid, indicating the absence of Carbonates. The Phenolphthalein test given above also affords an indication of Carbonates, if present.

Its addition in the proportion of 1 grain to the oz., or, if necessary, 1½ to 2 grains, is found (*Pr.* lxxiv. 221) to render the curd of Milk more easily digestible, but the salt tends to produce constipation.

The addition of 1 grain to 1 oz. Milk, increased if necessary to 2 or 3 grains to the oz., renders the curd of Milk more easily digested.—*L.* '05, ii. 364. In the feeding of the infant, 1 grain to the oz. of Milk is prescribed in a teaspoonful of Water and added by the mother to the bottle before every meal.—*B.M.J.* '05, ii. 1022.

While not denying the eupeptic action which has been ascribed to this drug in infantile gastro-enteritis, its chief value (*L.* '05, ii. 192) is its power of acting as an anti-emetic in the digestive troubles of bottle-fed infants, or in those who, although suckled, vomit for no definite reason.

Good results in dyspepsia.—*L.* '07, i. 309.

Official in U.S.

SODIUM COUMARATE.—There are three isomeric Coumaric acids (ortho-, meta-, and para-), forming salts with a Sodium base, known as Sodium Ortho-Coumarate, Sodium Meta-coumarate, and Sodium Para-coumarate. The employment of the Sodium salt of Cinnamic Acid in the treatment of cancer (*L.* '02, ii. 66; *B.M.J.* '05, i. 927) has led to a search for a similar substance possessing an increased physiological action. This has been found (*B.M.J.* '05, i. 1143) in Coumaric Acid, a substance having the structure of Cinnamic Acid with a hydroxyl substituent. A 22 p.c. aqueous solution of the **Sodium Ortho-coumarate** containing a slight excess of the free Ortho-coumaric Acid was tried. The solution induced a rapid physiological action, the leucocytosis being well marked and resembling that effected by the Cinnamate. An 8 p.c. solution of the less soluble **Sodium Para-coumarate** was employed; the results tending to show the action was of a similar nature, but rather less intense than that produced by the ortho-salt.

A 20 p.c. aqueous solution of the **Sodium Meta-coumarate** was used, and showed a very marked physiological action, being apparently even more active than the ortho-compound. The three acids are certainly physiologically active, but it must be left for further experiments to decide which of these is likely to prove to be the most serviceable therapeutic agent.

Beneficial in cancer, even in cases of worst possible type.—*L.* '07, ii. 690.

SODII ETHYLATIS LIQUOR.

SOLUTION OF SODIUM ETHYLATE.

A pale yellow, viscid, alcoholic liquid, prepared by dissolving 22 grains of clean, bright, metallic Sodium in 1 fl. oz. of Absolute Alcohol, care being taken to keep the contents of the flask cool during the reaction. It is officially described as a colourless liquid, but even when freshly prepared it scarcely answers this description, being usually of a pale straw-colour, and becoming yellowish-brown on keeping, and when traces of aldehyde are present in the Alcohol the change of colour is more rapid and occurs to a much greater extent, producing a deep brown.

This solution should be recently prepared, and should be preserved in well-stoppered bottles of a dark amber tint. It contains 18 p.c. of the solid substance, C_2H_5ONa.

If the Sodium be not bright, it is advisable to wash it with a little Absolute Alcohol before commencing to make the Liquor.

Medicinal Properties.—Caustic; used in the treatment of nævus, nasal polypus, ozœna, warts and lupus.—*L.* '78, ii. 625; '81, i. 168, 242; *B.M.J.* '85, ii. 344; '88, ii. 762.

Successful in multiple circumscribed lipomata.—*L.* '07, i. 943.

It may be applied by means of a glass rod, camel's-hair brush, or a quill pen. Tincture of Opium may be added to relieve the pain, but not Chloroform, as it makes an explosive mixture.

Tests.—Sodium Ethylate Solution is required by the *B.P.* to possess the sp. gr. of 0·867. It boils when heated, emitting vapours possessing an alcoholic odour, a white residue remaining, which undergoes hydrolysis when heated with Water, yielding a solution which possesses a strongly alkaline reaction towards red Litmus paper and which produces a strong red coloration with Phenolphthalein Solution. If a portion of this solution be evaporated to dryness it leaves a residue which should answer the tests distinctive of Sodium Hydroxide given under the heading of Soda Caustica. The white residue left on the evaporation of the Alcohol chars when strongly heated.

SODII HYPOPHOSPHIS.

SODIUM HYPOPHOSPHITE.

$NaPH_2O_2$, eq. 87·44.

Fr., Hypophosphite de Sodium; Ger., Natriumhypophosphit; Ital., Ipofosfito di Sodio; Span., Hipofosfito Sodico.

Colourless, translucent, deliquescent, prismatic crystals, or as a white, granular powder, possessing a slightly bitterish, saline taste. It is obtained by the interaction of Sodium Carbonate and Calcium Hypophosphite.

Sodium Hypophosphite, when mixed with an equal quantity of Sodium Nitrate, forms a highly explosive mixture.—*Y.B.P.* '87, 21.

It should be kept in well-closed vessels in a cool atmosphere and protected as far as possible from contact with the air, as it is stated to be of a deliquescent nature. The crystals or powder deliquesce slowly in very hot weather, but as soon as it cools [say to 18·3° C. (65° F.)] the salt dries up again. It should be handled with caution, as it is readily oxidised, and when brought into contact with powerful oxidising agents the temperature rises so rapidly that an explosion is liable to result. The formula given in the *B.P.* shows the official salt to be anhydrous; the *U.S.P.* formula is given with 1 molecule of Water of crystallisation; the salt is not official in the *P.G.*

Solubility.—1 in 1 of Water; 1 in 2 of Glycerin; almost entirely 1 in 20 of Alcohol (p.c.).

Medicinal Properties.—Similar to those of Calcii Hypophosphis.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme.

Not Official.—Syrupus Sodii Hypophosphitis.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr., Ital., Mex., Port., Span. and U.S.

Tests.—Sodium Hypophosphite when heated evolves spontaneously inflammable Hydrogen Phosphide gas and Hydrogen; the *U.S.P.* states that when heated in a test-tube the salt first loses its Water of crystallisation, and at about 200° C. (392° F.) it is decomposed, evolving Hydrogen and Hydrogen Phosphide gas, which burns spontaneously with a bright yellow flame. The salt answers the tests distinctive of Sodium given under that heading. It dissolves readily in Water, forming a clear solution which is neutral or only faintly alkaline to Litmus paper. The solution yields with warm Copper Sulphate Solution a reddish-brown precipitate of Cuprous Hydride, and on boiling evolves Hydrogen. It rapidly decolorises solution of Potassium Permanganate. The diluted aqueous solution acidulated with Diluted Sulphuric Acid yields on the addition of Silver Nitrate Solution a white precipitate rapidly turning from brown to black, owing to its reduction to metallic Silver. On the addition of Mercuric Chloride Solution to a 5 p.c. aqueous solution of the salt acidulated with Hydrochloric Acid, a white precipitate is produced, changing rapidly to grey, owing to its reduction to metallic Mercury. The *B.P.* utilises its reducing action on Potassium Permanganate Solution as a basis for a method of determination, requiring that when a weighed quantity of 0·5 of a gramme of the salt is boiled for 10 minutes with a solution of 1·15 grammes of Potassium Permanganate in 25 c.c. of Water and filtered, a nearly colourless filtrate should be yielded. No statement is made respecting the amount of pure Sodium Hypophosphite which compliance with this test indicates. It has been recommended that this Permanganate test should be replaced by one based on the work of Jowett; the method is described under Calcii Hypophosphis. The *U.S.P.* states that the salt should contain not less than 98 p.c. of pure crystallised Sodium Hypophosphite, but gives no method for its determination.

The more generally occurring impurities are Arsenic, Copper, Lead, Iron and Zinc, Calcium Magnesium, alkali or alkali Carbonate, Chlorides and Sulphates, Phosphates and Phosphites. Arsenic, if present, may be detected by the modified Gutzeit's test given in small type below under that heading; Copper, Lead, Iron and Zinc, if present, by the Hydrogen Sulphide test. The aqueous solution of the salt should afford no distinct turbidity with Ammonium Oxalate Solution after the addition of a little Ammonium Chloride Solution. If the mixture be allowed to stand for some time and filtered it should yield little or no turbidity with Sodium Phosphate Solution, indicating the absence of Calcium and Magnesium. The aqueous solution should neither be coloured red on the addition of Phenolphthalein T.S., nor should it effervesce on the addition of a diluted mineral acid. When acidified with Diluted Nitric Acid, the aqueous solution should afford no pronounced turbidity or precipitate with either Silver Nitrate Solution or Barium Chloride Solution, indicating the absence of more than traces of Chlorides and Sulphates. It is officially required to yield no precipitate with Lead Acetate Solution, indicating a limit of Phosphates and Phosphites. The remarks on the Lead Acetate test will be found under Calcii Hypophosphis.

Hydrogen Sulphide.—An aqueous solution (1-20) acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Gutzeit's Test.—If 5 c.c. of an aqueous solution of the salt (1-10) be measured into a beaker containing 3 c.c. of Nitric Acid diluted with about 10 c.c. of Water and evaporated to dryness on a water-bath, the residue should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Not Official.

SYRUPUS SODII HYPOPHOSPHITIS.—Dissolve 160 grains of Sodium Hypophosphite in 3 fl. drm. of Distilled Water, filter, and wash the filter with Distilled Water 1 fl. drm. To the filtered solution add sufficient Syrup to produce 20 fl. oz. Each fl. drm. contains 1 grain of Sodium Hypophosphite.—*B.P.C. Formulary* 1901.

Dose.—1 to 4 fl. drm. = 3·6 to 14·2 c.c.

Official in Mex.

Dissolve 2 of Sodium Hypophosphite in 2 of Distilled Water and add sufficient Syrup to the filtered solution to make 100.—*B.P.C.*

SODII IODIDUM.

SODIUM IODIDE.

NaI, eq. 148·78.

FR., IODURE DE SODIUM; GER., NATRIUMJODID; ITAL., JODURO DI SODIO; SPAN., YODURO SODICO.

Colourless, cubical crystals, or an odourless, white, crystalline, hygroscopic powder, possessing a somewhat bitter, saline taste. It is deliquescent in moist air, becoming partially decomposed; it should therefore be kept in well-closed bottles and in a cool place. It is officially described as a 'dry' powder, but commercial samples vary much in the proportion of Water which they contain, from 10 to 20 p.c.

Solubility.—11 in 6 of Water, and measures 10½; 1 in 3 of Alcohol (90 p.c.); 1 in 1 of Glycerin.

Medicinal Properties.—Given in the same doses as, and for purposes similar to those of, Potassium Iodide; is more readily tolerated by the stomach, and is less depressant.

5 to 10-grain doses for long continued administration, combined in the earlier stages with Ammonia, and in the later with from 3 to 5 minims of Fowler's Solution, in the treatment of pain at the heart after influenza.—*L.* '99, ii. 1081.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Foreign Pharmacopœias.—Official in all except Port.

Tests.—Sodium Iodide melts when strongly heated. It dissolves readily in Water, forming a clear solution which is faintly alkaline to red Litmus paper. It answers the tests distinctive of Sodium given under that heading. The aqueous solution yields with Silver Nitrate Solution a yellow curdy precipitate insoluble in Nitric Acid, practically insoluble in Ammonia Solution, but soluble in Potassium Cyanide Solution. With Mercuric Chloride T.S. it yields a scarlet precipitate soluble in excess of the reagent and very soluble in excess of Sodium Iodide. With Lead Acetate Solution it yields a yellow precipitate soluble in diluted Nitric Acid, and also in boiling Water, from which solution on cooling it recrystallises in beautiful crystalline scales. When the aqueous solution is mixed with Chlorine Water it yields a reddish-brown coloration, and on shaking the liquid with Carbon Bisulphide the latter solution is coloured a deep violet tint. The dried salt is required to contain not less than 98·9 p.c. of pure Sodium Iodide as determined volumetrically by titration with Tenth-normal Volumetric Silver Nitrate Solution, *see* below under the heading Volumetric Determination. It is officially required to lose not more than 5 p.c. of Water when dried at 120° C. (248° F.). Commercial samples vary much in the proportion of Water which they contain. The *U.S.P.* requires that the salt shall contain at least 98 p.c. of pure Sodium Iodide as volumetrically determined by the method given in small type below under the heading of Volumetric Determination. It does not state a limit of loss of weight when dried. The *P.G.* requires that 100 parts shall contain at least 95 parts of anhydrous salt; the *P.G.* does not include a limit of moisture.

The more generally occurring impurities are Arsenic, Copper, Lead and Iron, Ammonium, Barium, Magnesium and Potassium, Bromates and Carbonates, Cyanides, free Iodine, Iodates, Chlorides, Bromides, Thiosulphates and Sulphates. Arsenic, Copper, Lead and Iron, if present, may be detected by the time-limit test for heavy metals mentioned in small type under the heading of Hydrogen Sulphide. The salt should not evolve an odour of Ammonia when boiled with Potassium Hydroxide Solution, nor should the issuing vapour have an alkaline reaction upon moistened red Litmus paper, indicating the absence of Ammonium salts. The aqueous solution of the salt should yield no reaction with the test for Barium described below under the heading of Potassium Sulphate. It should yield a scarcely perceptible turbidity on the addition of Ammonium Oxalate Solution, and if the mixture be set aside for some time and filtered, the filtrate should yield little or no turbidity on the addition of Sodium Phosphate Solution, indicating the absence of Calcium and Magnesium. It should afford no reaction for Potassium when examined by the test given below under the heading of Sodium Bitartrate. The *B.P.* includes a test for Bromates, presumably that mentioned in the Appendix is to be applied to this salt. Its aqueous solution should not effervesce on the addition of a diluted mineral acid, indicating the absence of Carbonate. It should yield no indication of the presence of Cyanide when examined by the test with Ferrous Sulphate, Ferric Chloride and Alkali Hydroxide described below. No indication of free Iodine should be yielded when ½ gramme of the salt is dissolved in 10 c.c. of Distilled Water, which has been previously boiled and cooled in a small flask, as indicated by the solution not acquiring a yellow tint, nor should the solution acquire a yellow colour within half a minute after an addition of 2 drops of Diluted Sulphuric Acid, indicating the absence of Iodate. Chlorides, Bromides and Thiosulphates, if present, may be detected by the test with Tenth-normal Volumetric Silver Nitrate Solution and Ammonia described below in small type. An aqueous solution of the salt should not afford a distinct turbidity with Barium Chloride Solution, indicating the absence of more than traces of Sulphates. The *U.S.P.* includes a test for limit of alkali, requiring that a drop of Phenolphthalein T.S. added to a solution of 1 gramme of the salt in Water, and containing 0·1 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution should not produce a red coloration. The *P.G.* and the *U.S.P.* both include a test for Nitrates and Nitrites, that of the former Pharmacopœia fixing a limit for these impurities by the adoption of a time limit during which no coloration should become apparent; the tests are described in small type below under the headings of Aluminium Wire and Potassium Hydroxide, or Zinc filings, powdered Iron and Sodium Hydroxide; the *U.S.P.* employing the former mixture, the *P.G.* the latter. The *P.G.* includes a separate test for Iron described below under the heading of Potassium Ferrocyanide Solution. The alternative method for the determination of Potassium Iodide in a mixture of Potassium Chloride, Bromide and Iodide described under the heading of Potassii Iodidum is equally applicable in the case of the Sodium Iodide.

Hydrogen Sulphide.—An aqueous solution (1–20) should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; slightly acidulated with Hydrochloric Acid it should not respond to the time-limit test for heavy metals, *U.S.P.*

Barium Nitrate.—An aqueous solution of the salt (1–20) should not be affected by T.S. of Barium Nitrate, *P.G.*

Ferrous Sulphate, Ferric Chloride, and Alkali Hydroxide.—If an aqueous solution of the salt (1–20) be gently warmed with a crystal of Ferrous Sulphate, 1 drop of Ferric Chloride T.S. and Sodium Hydroxide T.S. the mixture should not be coloured blue on supersaturating with Hydrochloric Acid, *P.G.*; 5 c.c. of the aqueous solution, gently heated with 1 drop each of Ferrous Sulphate and Ferric Chloride T.S. and 0·5 c.c. of Potassium Hydroxide T.S., should not develope a blue colour after acidulating with Hydrochloric Acid, *U.S.P.*

Sulphuric Acid.—If Starch T.S. and diluted Sulphuric Acid be added as quickly as possible to a freshly prepared solution (1–10) of the salt in previously boiled and cooled Water, the solution should not be immediately coloured, *P.G.* The *U.S.P.* states that the solution of 0·5 gramme of the salt in 10 c.c. of previously boiled and cooled Distilled Water should not have a distinct yellow tint, nor should it acquire a yellow colour within half a minute after the addition of 2 drops of Diluted Sulphuric Acid (which should be free from Sulphurous Acid or Nitrous Acid).

Phenolphthalein.—A solution of 1 gramme of the salt in Water with 0·1 c.c. of Tenth-normal Sulphuric Acid Volumetric Solution added should give no red colour with a drop of Phenolphthalein T.S. even after heating, *U.S.P.*

Sodium Bitartrate.—A solution of 1 gramme of the salt in 1 c.c. of Water should yield no precipitate with 1 c.c. of Sodium Bitartrate, *U.S.P.*

Potassium Sulphate.—10 c.c. of an aqueous solution (1–20) acidulated with Hydrochloric Acid should not be rendered turbid by the addition of 1 c.c. of T.S. of Potassium Sulphate, *U.S.P.*

Potassium Ferrocyanide.—20 c.c. of an aqueous solution (1–20) after the addition of a few drops of Hydrochloric Acid should not be rendered blue by 0·5 c.c. of Potassium Ferrocyanide, *P.G.*

Zinc Filings, Powdered Iron, and Sodium Hydroxide.—1 gramme of the salt warmed with 5 c.c. of Sodium Hydroxide T.S. and a mixture of 0·5 gramme of Zinc filings and powdered Iron, should not evolve Ammonia, *P.G.*

Aluminium Wire and Potassium Hydroxide.—If to 1 gramme of the salt contained in a test-tube of about 40 c.c. capacity, 5 c.c. of Water, 5 c.c. of Potassium Hydroxide T.S., and about 0·2 gramme of Aluminium wire be added, and if in the upper portion of the test-tube a pledget of purified Cotton be inserted, and over the mouth there be placed a piece of moistened red Litmus paper, then if the tube be heated upon a water-bath for 15 minutes, no blue coloration of the paper should be discernible, *U.S.P.*

Tenth-normal Volumetric Silver Nitrate and Ammonia.—If 0·2 gramme of the salt (dried, *P.G.*) be dissolved in 2 c.c. of Ammonia T.S. and 15 c.c. (14 c.c., *P.G.*) of Tenth-normal Silver Nitrate Volumetric Solution be added, then after thoroughly agitating and filtering, the filtrate upon supersaturating with Nitric Acid, should not become more than slightly turbid, nor should any darkening appear within 10 minutes, *P.G.* and *U.S.P.*

Volumetric Determination.—A solution of 1 gramme of the salt [dried at 120° C. (248° F.)] in Water should require the addition of not less than 66·5 c.c. of Volumetric Solution of Silver Nitrate for complete precipitation, *B.P.*; a solution of 0·5 gramme of the well dried salt in 10 c.c. of Water with about 5 drops of Potassium Chromate T.S. added, should require not more than 34·6 c.c. nor less than 33 c.c. of Tenth-normal Silver Nitrate Volumetric Solution to produce a permanent red colour (corresponding to at least 98 p.c. of pure Sodium Iodide), *U.S.P.*

Not Official.

Rubidium Iodide has been used for similar purposes to the Potassium Iodide.

Dose.—5 to 20 grains = 0·32 to 1·3 grammes.

SODII NITRIS.

SODIUM NITRITE.

$NaNO_2$, eq. 68·58.

White, or yellowish-white, fused pencils or sticks, with a crystalline fracture; or a whitish, deliquescent crystalline powder, possessing a mild, saline taste, and an alkaline reaction.

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from contact with the air and light, it has a tendency to deliquesce and to become gradually oxidised. It is frequently found in commerce fused into sticks, with a crystalline fracture. It is prepared by fusing Sodium Nitrate with reducing substances, such as metallic Lead, Barium Sulphide, etc., but if the reduction is carried too far, free alkali is formed and afterwards becomes carbonated.

Solubility.—5 in 6 of Water, 1 in 50 of Alcohol (90 p.c.).

Medicinal Properties.—Vaso-dilator and antispasmodic. Used with the object of warding off the attack in angina pectoris and asthma, as well as relieving the symptoms during an attack; also in migraine and hemicrania if accompanied by facial pallor. It is not so rapid in its action as Amyl Nitrite, but is more persistent and more gentle. It is of great service in lowering arterial tension in renal cirrhosis.

Closely approaches the action of Nitroglycerin, but without its objectionable features.—*Pr.* xxx. 179.

1 to 4-grain doses every 3 or 4 hours combined with Aromatic Spirit of Ammonia, and sometimes with $\frac{1}{20}$ grain of Morphine Hydrochloride in angina pectoris.—*Pr.* lii. 348.

Dose.—1 to 2 grains = 0·06 to 0·13 gramme.

Official Preparation.—Used in the preparation of Liquor Ethyl Nitritis.

Antidotes.—Emetics, fresh air, recumbent position, Ergot, and Atropine.

Foreign Pharmacopœias.—Official in Swiss and U.S.

Tests.—Sodium Nitrite when heated melts, and at red heat is decomposed. It dissolves readily in Water, forming a clear solution, slightly alkaline in reaction towards red Litmus paper. It answers the tests distinctive of Sodium given under that heading. Potassium Iodide Solution and Starch Mucilage when added to an aqueous solution yield on the addition of a few drops of Diluted Sulphuric Acid a blue coloration. With Ferrous Sulphate Solution and Acetic Acid the aqueous solution affords a deep brown colour, the salt evolves red fumes when mixed with Diluted Sulphuric Acid. It is officially required to contain not less than 95 p.c. of Sodium Nitrite as gasometrically determined by measuring the quantity of Nitrous Acid gas evolved, when a solution of a weighed quantity is introduced into a nitrometer containing a saturated solution of Brine, Potassium Iodide and Diluted Sulphuric Acid, a weighed quantity of 0·1 of a gramme of the salt should liberate at the ordinary temperature 15·5° C. (60° F.) and pressure (30 in. or 760 mm. of Mercury) not less than 32·5 c.c. of gas, which should be almost completely absorbed by concentrated Ferrous Sulphate Solution. It has been suggested that the Volumetric Permanganate test is better than the gasometric method now official. This is a very appropriate recommendation, the volumetric test being readily and quickly carried out and being much better adapted to the purpose than the obsolete method of gasometric analysis. Good commercial samples commonly yield 98 p.c. of pure Sodium Nitrite. The 17th Edition of *Squire's Companion* stated that in the absence of a nitrometer it may be readily estimated with a standard solution of Potassium Permanganate, 0·1 of a gramme of pure Sodium Nitrite being equal to 29 c.c. of Tenth-normal Volumetric Potassium Permanganate Solution (containing 3·156 grammes of Potassium Permanganate in 1 litre) or to 9·1 c.c. of Liquor Potassii Permanganatis, *B.P.* The *U.S.P.* requires the salt to contain not less than 90 p.c. of pure Sodium Nitrite as volumetrically determined by the addition of an excess of Tenth-normal Volumetric Potassium Permanganate Solution, titrating the excess of the latter with Tenth-normal Volumetric Oxalic Acid Solution as described under the heading of Volumetric Determination in small type below.

The more generally occurring impurity is Lead. The *B.P.* requires that on the addition of Diluted Sulphuric Acid to the aqueous solution not more than the slightest traces of a precipitate should be produced, indicating the absence of Lead; the *U.S.P.* employs the time-limit test with Hydrogen Sulphide for the detection of heavy metals, such as Arsenic, Copper, Lead, Iron and Zinc.

Time-limit Test.—If 1 gramme of the salt be dissolved in 20 c.c. of Diluted Hydrochloric Acid, and heated sufficiently to expel the gases, the resulting solution after restoring it to its original volume should not respond to the time-limit test for heavy metals, *U.S.P.*

Volumetric Determination.—If to 30 c.c. of Tenth-normal Volumetric Potassium Permanganate Solution, diluted with about 150 c.c. of Distilled Water, 5 c.c. of Sulphuric Acid and 10 c.c. of a solution of 1 gramme of Sodium Nitrite in sufficient Distilled Water to make 100 c.c. be successively added, the liquid brought to a temperature of 40° C. (104° F.) and allowed to stand for 5 minutes, not more than 3·75 c.c. of Tenth-normal Oxalic Acid Volumetric Solution should be required to decolorise the solution (each c.c. of Tenth-normal Potassium Permanganate consumed corresponding to 0·0034285 gramme of pure Sodium Nitrite, *U.S.P.*

Not Official.

SODIUM PERBORATE.—A white, crystalline substance which possesses the property of evolving Hydrogen Peroxide when dissolved in cold Water. —*B.M.J.* '05, i. 310; *P.J.* '05, i. 193.

SODIUM PHENOL SULPHO-RICINATE.—This has been used as a spray in the treatment of papillomata.—*B.M.J.* '04, ii. 1225.

SODIUM PHENYLPROPIOLATE.—Phenyl-propiolic Acid is prepared by treating Methyldibromocinnamate with alcoholic solution of Potassium Hydroxide. The pure acid has a m.p. 136° to 137° C. (276·8° to 278·6° F.). The Sodium salt is a white powder very soluble in Water. Under the name of **Thermiol** a 25 p.c. solution of this salt has been introduced into medicine. It is used as an inhalation in the form of 1 to 3 p.c. solution for tuberculosis and affections of the throat and lungs.

Not Official.

SODII OLEATIS SOLUTIO, *see* p. 824.

SODII ET POTASSII TARTRAS.

See SODA TARTARATA, p. 1088.

SODII PHOSPHAS.

SODIUM PHOSPHATE.

Na_2HPO_4, $12H_2O$, eq. 355·64.

FR., PHOSPHATE MONO-ACIDE DE SODIUM; GER., NATRIUMPHOSPHAT; ITAL., FOSFATO BISODICO; SPAN., FOSFATO SODICO.

Colourless, translucent, efflorescent, rhombic crystals, possessing a cooling taste and alkaline reaction.

There are three Sodium Phosphates, the Ortho-, Meta-, and Para-phosphates. The official salt is the Di-sodium Hydrogen Ortho-phosphate.

It should be kept in well-closed vessels and in a cool atmosphere, as it has a tendency to effloresce on exposure to air. It may be prepared by the interaction of Acid Calcium Phosphate with Sodium Carbonate. Acid Calcium Phosphate is produced on mixing Bone-ash and Sulphuric Acid.

The exsiccated salt, **Sodii Phosphas Exsiccatus,** forms an odourless white powder, which is convenient for mixing with other powders. 1 of the dried salt equals about 2 of the crystalline.

It is liable to be contaminated with Arsenic: of course only Arsenic-free samples should be used in medicine.

Solubility.—1 in 6 of Water; dissolves in its own Water of crystallisation below 212° F.; insoluble in Alcohol (90 p.c.).

Medicinal Properties.—A mild, saline purgative; from its pure saline taste it is called Tasteless Aperient Salt, and is often given to children. Diuretic, antacid and antilithic in small doses. As it renders the urine alkaline, it is sometimes useful in gout.

In a case of diabetes mellitus, 20 grains twice daily by the mouth, a solution being subsequently used hypodermically.—*B.M.J.* '03, i. 1205.

By hypodermic injection in various nervous diseases.—*B.M.J.E.* '93, ii. 108.

Incompatible with alkaloids.—*T.G.* '94, 334.

Dose.—30 to 120 grains = 2 to 8 grammes, for repeated administration; for a single administration, $\frac{1}{4}$ to $\frac{1}{2}$ an oz. = 7·1 to 14·2 grammes.

Official Preparation.—Sodii Phosphas Effervescens. Used in the preparation of Ferri Phosphas.

Not Official.—Liquor Sodii Phosphatis Compositus.

Foreign Pharmacopœias.—Official in all except Dan. and Norw.

Sodii Phosphas Exsiccatus is official in Swiss and U.S.

Tests.—Sodium Phosphate when exposed to dry air loses, according to the *U.S.P.*, 5 molecules of Water of crystallisation, equivalent to 25·1 p.c.; the *B.P.* states that when heated to a dull red heat it loses its Water of crystallisation, equivalent to 62·84 of its weight; the *U.S.P.* states that at 100° C. (212° F.) it loses all its Water of crystallisation, equivalent to 60·3 p.c. and that at a red heat it is converted into Sodium Pyrophosphate. The crystallised salt liquefies at about 40° C. (104° F.). It answers the tests distinctive of Sodium given under that heading. It dissolves readily in Water, yielding a clear solution which is slightly alkaline in reaction towards red Litmus paper. The aqueous solution yields on the addition of Silver Ammonio-nitrate Solution a light yellow precipitate readily soluble in Ammonia Solution, and in cold diluted Nitric Acid. Magnesium Ammonio-sulphate Solution yields with the aqueous solution a white crystalline precipitate soluble in diluted mineral acid. The aqueous solution containing some free Nitric Acid affords on warming with an excess of Ammonium Molybdate Solution a yellow precipitate soluble in Ammonia and reprecipitated as a white crystalline precipitate on the addition of Magnesium Ammonio-sulphate Solution. No requisite percentage of pure crystallised Sodium Phosphate is mentioned in the *B.P.*, nor is a method of determination included. The percentage of pure crystallised Sodium Phosphate present may be determined by direct titration with Normal Volumetric Sulphuric Acid Solution, employing Methyl Orange Solution as an indicator of neutrality as described under Sodii Arsenas.

On account of the high molecular weight of the salt, 3 grammes is suggested as a suitable quantity to be used for the determination. The *U.S.P.* requires that the uneffloresced salt should contain not less than 99 p.c. of pure Di-sodium Ortho-phosphate, but gives no method of determination. The *P.G.* does not state either a requisite percentage or a method of determination.

The more generally occurring impurities are Arsenic, Copper, Lead, Iron and Zinc, Ammonium, Calcium, Potassium, Carbonates, Chlorides and Sulphates. The discovery of Arsenic in the commercial salt caused a sensation in 1900, and numerous methods were suggested with a view to arriving at a satisfactory test for Arsenic. Its presence may be detected by the modified Gutzeit's test mentioned below, which is that employed by the *U.S.P.* The *P.G.* employs the Bettendorf's test given under the heading of Stannous Chloride. Standards have been suggested (*C.D.* '08, i. 796) of 5 parts per million for Lead, and 5 parts per million for Arsenic. Copper, Lead, Iron and Zinc, if present, may be detected by Hydrogen Sulphide, either in a solution rendered acid by Diluted Hydrochloric Acid or in a solution rendered ammoniacal by Ammonia Solution, as described under the heading of Hydrogen Sulphide in small type below. An aqueous solution of the salt should not afford an ammoniacal odour when boiled with Potassium Hydroxide Solution, nor should the issuing vapour possess an alkaline reaction towards a piece of moistened red Litmus paper, indicating the absence of Ammonium salts. The aqueous solution should not afford a distinct opalescence with Ammonium Oxalate Solution, indicating the absence of Calcium. It should not impart a decided violet coloration to a non-luminous flame when viewed through a piece of blue glass, indicating the absence of Potassium. It should yield no effervescence on the addition of Diluted Sulphuric Acid, indicating the absence of Carbonate. The aqueous solution when acidified with Nitric Acid should yield not more than a slight reaction for Chlorides and Sulphates when examined by the tests described below under the headings of Silver Nitrate and Barium Nitrate.

Hydrogen Sulphide.—An aqueous solution (1–20) should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Barium Nitrate.—The aqueous solution (1–20) acidulated with Nitric Acid should not be rendered turbid more than opalescent with Barium Nitrate T.S. within 3 minutes, *P.G.*

Silver Nitrate.—An acidulated solution as above should not be rendered more than opalescent within 3 minutes by T.S. of Silver Nitrate, *P.G.*

Gutzeit's Test.—5 c.c. of an aqueous solution of the salt (1–10) should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Stannous Chloride.—A mixture of 1 gramme of previously dehydrated and powdered salt and 3 c.c. of Stannous Chloride T.S. should not assume a dark colour in the course of an hour, *P.G.*

Preparation.

SODII PHOSPHAS EFFERVESCENS. EFFERVESCENT SODIUM PHOSPHATE.

Sodium Phosphate, in crystals, 50; Sodium Bicarbonate, in powder, 50; Tartaric Acid, in powder, 27; Citric Acid, in powder, 18; made into granules, the total weight of which is about 100.

Dose.—60 to 120 grains = 4 to 8 grammes, for repeated administration; for a single administration, ¼ to ½ an oz. = 7·1 to 14·2 grammes.

Official in U.S.

Not Official.

LIQUOR SODII PHOSPHATIS COMPOSITUS.—Sodium Phosphate, 100; Sodium Nitrate, 4; Citric Acid, 13; Distilled Water, *q.s.* to make 100. Triturate the Sodium Phosphate and Sodium Nitrate with the Citric Acid until completely liquefied, then add sufficient Water to produce 100. Filter the liquid and keep it in well-stoppered bottles in a moderately warm place.—*U.S.P.*

This has been incorporated in the *B.P.C.*

Not Official.

SODII PHOSPHAS ACIDUS.

Large, translucent, rhombic crystals, readily soluble in Water. Given in cases of alkaline urine.

Results showing the power of the drug to increase the acidity of the urine.—*B.M.J.* '03, i. 1256; *L.* '03, i. 662.

Dose.—30 to 60 grains = 2 to 4 grammes every 3 hours, but it is better to give smaller quantities oftener to ensure continuous elimination.

Sodii Pyrophosphas in Swiss and U.S.

SODII SALICYLAS.

SODIUM SALICYLATE.

$NaC_7H_5O_2$, eq. 158·89.

FR., SALICYLATE NEUTRE DE SODIUM; GER., NATRIUMSALICYLAT; ITAL., SALICILATO DI SODIO; SPAN., SALICILATO SODICO.

There are two Sodium Salicylates, the one prepared with the 'Natural' Acid, the other with the 'Artificial' Acid.

The former is in yellowish or pinkish-white pearly scales, or as a pinkish-white amorphous powder, possessing a sweetish saline taste, and frequently a faint odour of Methyl Salicylate; the latter is in white lustrous pearly scales, or a white amorphous powder, with a sweetish saline taste. They may be obtained by the interaction of the respective Salicylic Acids and Sodium Carbonate or Sodium Hydroxide.

Both varieties should be kept in well-closed bottles of a dark amber tint.

The *B.P.* formula for the salt shows ½ a molecule of Water of crystallisation. The *U.S.P.* formula represents the salt as anhydrous, which is correct.

100 parts of Sodium Salicylate contain 86 parts of Acid Salicylic.

Solubility.—1 in 1 of Water; 1 in 5 of Alcohol (90 p.c.); 1 in 30 of Absolute Alcohol.

Medicinal Properties.—Given as a specific in acute rheumatism, in which it lowers the temperature, lessens the pain and swelling, and also the liability to complications such as pericarditis.

Occasionally used as an antipyretic in pneumonia, typhoid and all pyrexial affections. A soluble form of Salicylic Acid, and less irritating. Useful in influenza, diabetes, chronic rheumatism, sciatica and in acute tonsillitis, which is so often rheumatic in origin. One of the best antiseptics for fermentative dyspepsia. It increases the acidity of the urine. Brunton says that in obstinate constipation due to gout its administration will tend to keep the bowels regular without any purgative whatever.

Combined with Potassium Bromide, in headache, *Pr.* lii. 101; *T.G.* '94, 335; in pleuritis, *T.G.* '94, 101; reason for advantage of natural over artificial Salicylate, *Pr.* lii. i. 447; of great value in psoriasis and in many forms of erythema, especially e. nodosum, *L.* '80, i. 627; '95, i. 1422; *B.M.J.* '86, i. 737; *T.G.* '85, 446. In exophthalmic goître.—*B.M.J.E.* '95, i. 91.

As a means of diagnosis between rheumatism and gout; if the patient improved under Salicylate treatment the disease was rheumatic, if not it was gout.—*L.* '99, ii. 441.

Larger doses of the salt prepared from the 'natural' acid could be given with less ill effects.—*L.* '00, i. 1016.

In pneumonia 8 to 10 grains every 2 hours.—*Pr.* lxiv. 330.

Temporary blindness resulting from 140 to 150 grains taken over a period of 60 hours.—*B.M.J.* '01, ii. 81.

10 to 20 grains combined with 10 grains Quinine Sulphate every 4 hours in malarial fever.—*L.* '03, ii. 95, 200, 631.

In the treatment of chorea 10-grain doses with 20 grains Sodium Bicarbonate for a child of 6 to 10 years; increasing the quantities to 15 and 30 grains respectively, after 2 or 3 days; and if necessary to 20 and 40 grains respectively after a further 2 or 3 days. A careful watch is kept for any symptoms of Salicylate poisoning.—*B.M.J.* '03, ii. 451.

Has been used as an endo-articular and as an intravenous injection in sterile Water, under strict aseptic precautions, in cases of acute articular rheumatism. —*M.P.* '04, ii. 472; *B.M.J.E.* '04, ii. 60.

Intravenous injection of 2 c.c. of Mendel's mixture, the latter containing 17·5 p.c. of Sodium Salicylate and 2·5 p.c. Caffeine; in the treatment of rheumatic affections. When injected into the veins one sees the specific action of Salicylates in rheumatism at its best.—*B.M.J.E.* '05, i. 43.

Very beneficial in posterior urethritis.—*F.T.* '07, 84. No need to discontinue it during pericarditis.—*B.M.J.* '07, i. 814.

Dose.—10 to 30 grains = 0·65 to 2 grammes.

Prescribing Notes.—*Best given in* **solution** *well diluted, to avoid dyspepsia, but may also be prescribed in* **cachets** *or* **powders**. *When dissolved in Water and mixed with Ammonia, the solution soon becomes yellow or brown on exposure to the air, which happens in mixtures containing the salt and Aromatic Spirit of Ammonia when the bottle is half full. It is sometimes prescribed with Citric Acid, which precipitates the Salicylic Acid. It is better to give it with Sodium or Potassium Citrate. When prescribed with a salt of Quinine, Quinine Salicylate is formed, which is only slightly soluble, and is therefore thrown out.*

Official Preparation.—Used in the preparation of Bismuthi Salicylas.

Foreign Pharmacopœias.—Official in all the Foreign Pharmacopœias except Port. Dutch has also Salicylas Natricus cum Coffeino.

Tests.—Sodium Salicylate when heated emits white inflammable vapours, possessing an odour of Phenol, leaving a carbonaceous residue, which, when dissolved in Water, produces a solution having a strong alkaline reaction towards red Litmus paper, and which effervesces on the addition of a diluted mineral Acid. It dissolves readily in Water, forming a clear solution which is neutral to Litmus paper or only faintly acid towards blue Litmus paper. The *B.P.*

states that a concentrated aqueous solution affords with Ferric Chloride T.S. a reddish-brown coloration, and a diluted aqueous solution a violet coloration with the same reagent. The *U.S.P.* states that Ferric Chloride T.S. added to an excess of a concentrated aqueous solution of the salt produces a violet precipitate, but when added to a diluted solution (1 in 100) it produces a deep violet-blue colour; the *P.G.* states that a 1 in 1000 aqueous solution affords a bluish-violet coloration on the addition of Ferric Chloride T.S. A 1 in 20 aqueous solution affords a green coloration with Copper Sulphate T.S. A 10 p.c. aqueous solution yields on the addition of Diluted Sulphuric Acid a white crystalline precipitate readily soluble in Ether. If the precipitate produced on acidification be separated by filtration, washed and carefully dried, it should possess the m.p. and answer the tests distinctive of Salicylic Acid given under Acidum Salicylicum. A small quantity of the salt, when warmed with a little concentrated Sulphuric Acid and a few drops of Methyl Alcohol, evolves a distinctive odour of Methyl Salicylate. Neither the *B.P.* nor the *P.G.* states what percentage of pure Sodium Salicylate should be present in the salt, nor does either give a method of determination. It may be determined by titration of the solution of the residue left on ignition, with Normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as an indicator of neutrality; 1 c.c. of the Normal Volumetric Acid Solution being equivalent to 0·15889 gramme of pure Sodium Salicylate. The *U.S.P.* requires it to contain 99·5 p.c. of pure Sodium Salicylate as volumetrically determined by titrating the solution obtained by exhausting the residue left on thoroughly igniting the salt at a red heat, with boiling Water, until the washings cease to react with Methyl Orange Solution as described in small type below under the heading Volumetric Determination.

The more generally occurring impurities are Arsenic, Copper, Lead, Iron and Zinc, Chlorides, Sulphates and Sulphites, organic impurities and Carbonates, unconverted Phenol, and isomers or homologues of Salicylic Acid. Copper, Lead, Iron and Zinc, if present, are indicated by the time-limit test described under the heading of Hydrogen Sulphide. When Diluted Nitric Acid is added in slight excess to an aqueous solution of the salt and the precipitated Salicylic Acid is removed by filtration, the filtrate should yield only a slight turbidity on the addition of Silver Nitrate Solution or Barium Chloride Solution, indicating the absence of more than traces of Chlorides and Sulphates. The *B.P.* states that if the aqueous solution be acidulated with Nitric Acid and the precipitate be dissolved with a little Alcohol (90 p.c.) the mixture affords not more than the slightest reactions with the tests for Sulphates or for Chlorides. The word 'acidulated' should be 'supersaturated,' as sufficient Nitric Acid over and above that necessary to completely decompose the Sodium Salicylate must be added in order to prevent the precipitation of Silver Salicylate. If a 5 p.c. aqueous solution of the salt be mixed with a few drops of Iodine T.S. and a few drops of Hydrochloric Acid, the filtrate should yield no precipitate upon the addition of

Barium Chloride Solution, indicating the absence of Sulphites. The salt should dissolve without coloration and without effervescence in cold Sulphuric Acid, indicating the absence of organic impurities and of Carbonates. The concentrated aqueous solution, when shaken with an equal volume of Ether, and the ethereal solution allowed to evaporate spontaneously, the residue should be free from any odour of Phenol. The *B.P.* states that 50 to 100 grammes of the salt, kept in a closed vessel for several days, should not evolve the faintest odour of Phenol. Isomers and homologues of Salicylic Acid can be detected, if present, by their influence on the m.p. of the acid separated from the salt on acidification. The *B.P.* includes a test for distinguishing Salicylates from Carbolates and Sulphocarbolates. A solution containing not less than 1 p.c. is stated to afford a yellowish-brown precipitate with Uranium Nitrate Solution. Carbolates and Sulphocarbolates presumably afford no precipitate with Uranium Nitrate Solution; it is difficult, therefore, to gauge the value of this test, as it will certainly not detect the presence of Carbolates and Sulphocarbolates in the Salicylate. The test also appears under Acidum Salicylicum, and is commented upon in large type under the heading of Tests.

Sulphuric Acid.—The salt is soluble without effervescence or coloration in cold Sulphuric Acid, *B.P.* and *P.G.*; the *P.G.* uses 0·1 gramme of salt and 1 c.c. of acid.

Hydrogen Sulphide.—An aqueous solution (1-20) should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; acidulated with Hydrochloric Acid and filtered, the filtrate should not respond to the time-limit test for heavy metals, *U.S.P.*

Silver Nitrate.—2 volumes of an aqueous solution (1-20) mixed with 3 volumes of Alcohol (90 p.c.) and acidified with Nitric Acid should not be affected by T.S. of Silver Nitrate, *P.G.* Also given in *B.P.* without quantities.

Barium Nitrate.—An aqueous solution (1-20) should not be affected by T.S. of Barium Nitrate, *P.G.* The *B.P.* directs the addition of Nitric Acid and Alcohol, as in the Silver Nitrate test, and uses Barium Chloride Solution.

Iodine and Barium Chloride.—If to an aqueous solution of the salt (1-20) 3 drops of Iodine T.S. and a slight excess of Hydrochloric Acid be added, the filtrate from this mixture should not yield a precipitate upon the addition of T.S. of Barium Chloride, *U.S.P.*

Volumetric Determination.—If 1 gramme of the dry salt be thoroughly ignited at a red heat, and the residue extracted with boiling Distilled Water until the washings cease to react with Methyl Orange T.S., the mixed filtrate and washings should require for complete neutralisation not less than 12·5 (12·52) c.c. of Semi-normal Volumetric Sulphuric Acid Solution, Methyl Orange T.S. being used as indicator, *U.S.P.*

Not Official.

SODII DITHIO-SALICYLAS (Dithion).—A yellowish-white, amorphous, somewhat hygroscopic powder, antiseptic and antipyretic. Used in the form of powder, solution or ointment. Has been found useful in the treatment of rheumatism.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme.

Liquor Natrii Silicici (Soluble Glass) is official in Austr. and Ger.

SODII SULPHAS.

SODIUM SULPHATE.

$Na_2SO_4 10H_2O$, eq. 319·90.

FR., SULFATE DE SODIUM OFFICINAL; GER., NATRIUMSULFAT; ITAL., SOLFATO DI SODIO; SPAN., SULFATO SODICO.

Colourless, transparent, efflorescent, monoclinic prisms, having a bitter, cooling, saline taste.

It should be kept in well-closed vessels and in a cool atmosphere, as it is readily effloresced on exposure to air, losing its Water of crystallisation.

Sodii Sulphas Exsiccatus, is an odourless white powder, 1 of which equals 2¼ of the crystalline salt. Much more convenient than the crystals for mixing with other powders.

Solubility.—1 in 3 of Water, and measures 3½; 10 in 3 of Water at 92° F.; 10 in 4½ of Water at 212° F.; insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Hydragogue purgative and cholagogue; useful in cases of gall-stones and of liver disease; in small repeated doses it is especially well adapted for cases of constipation associated with gout and hepatic dyspepsia.

Given in 1-drm. doses in either Fennel or Cinnamon Water 4, 5 or 6 times a day in the treatment of dysentery.—*I.M.G.* '05, ii. 280. In acute cases no drug is known which acts so rapidly, painlessly, or so effectually.

Dose.—30 to 120 grains = 2 to 8 grammes, for repeated administration; for a single administration, ¼ to ½ an ounce = 7·1 to 14·2 grammes.

Official Preparation.—Sodii Sulphas Effervescens.

Not Official.—Pulvis Sodii Sulphatis et Zingiberis, Pulvis Salis Carolini Factitii Effervescens, Sal Carolinum Factitium.

Foreign Pharmacopœias.—Official in Hung. (Natrium Sulfuricum Crystallisatum), also Siccum; Dan., Dutch, Norw. and Swed. (Sulphas Nitricus); Dan. and Swed., also Siccatus; Dutch, also Exsiccatus; Fr. Sulfate de Sodium Officinal); Austr., Belg., Jap. and Swiss (Natrium Sulphuricum), also Siccum; Ital. (Solfato di Sodio); Mex. (Sulfato de Sodio); Port. (Sulphato de Soda); Russ. (Natrium Sulfuricum), Depuratum, and Siccum; Span. (Sulfato Sodico); U.S.

Tests.—Sodium Sulphate melts when heated. The *U.S.P.* says the salt fuses at 33° C. (91·4° F.). When dried at 100° C. (212° F.) it loses the whole of the Water of crystallisation, equivalent to 55·9 p.c.; the *B.P.* states when exposed to heat in a porcelain crucible, but gives no indication as to the temperature. It answers the tests distinctive of Sodium given under that heading. It dissolves readily in Water, forming a clear solution which is neutral in reaction towards Litmus paper, and which, on the addition of Barium Chloride Solution, yields a white precipitate insoluble in Hydrochloric Acid. It is officially required to contain 100·0 p.c. of pure crystallised Sodium Sulphate, as gravimetrically determined by precipitating the aqueous solution of 1 gramme of the salt, acidulated with Hydrochloric Acid, with Barium Chloride Solution; the white precipitate produced, when well washed and dried, should weigh 0·725 of a gramme. The *U.S.P.*

requires the salt to contain in an uneffloresced condition not less than 99 p.c. of pure crystallised Sodium Sulphate, but no method of determination is given. The *P.G.* does not state either a percentage or a method of determination.

The more generally occurring impurities are Arsenic, Copper, Lead and Iron, Ammonium, Calcium, Magnesium and Potassium, Carbonates and Chlorides. The *B.P.* includes also a test for Aluminium, an impurity of comparatively trivial importance, but omits a test for Arsenic, a much more likely one to be found and one possessing much greater importance. The presence of Arsenic much in excess of 1 in 100,000 is indicated by the sample responding to the modified Gutzeit's test described below. The *P.G.* employs the Bettendorf test for Arsenic with Stannous Chloride Solution. Standards have been suggested (*C.D.* '08, i. 796) of 5 parts per million for Lead, and 2 parts per million for Arsenic. Copper, Iron and Lead, if present, may be indicated by the coloration produced by Hydrogen Sulphide in either a solution slightly acidified with Hydrochloric Acid or a solution made slightly alkaline with Ammonia. The *P.G.* includes a separate test for Iron described below under the heading of Potassium Ferrocyanide. The aqueous solution of the salt should not afford an ammoniacal odour when boiled with Liquor Potassæ, nor should the issuing gas possess an alkaline reaction towards moistened red Litmus paper, indicating the absence of Ammonium salts. It should yield no turbidity with Ammonium Oxalate Solution, indicating the absence of Calcium, and when to the mixture is added Ammonium Chloride, allowed to stand some time and filtered, the filtrate should not yield a turbidity on the addition of Sodium Phosphate Solution, indicating the absence of Magnesium. When viewed through a piece of blue glass no violet coloration should be imparted to a non-luminous flame when a crystal of the salt moistened with Hydrochloric Acid is introduced, indicating the absence of Potassium. A strong aqueous solution of the salt should yield no effervescence on the addition of Hydrochloric Acid, indicating the absence of Carbonates. When acidified with diluted Nitric Acid it should yield no decided turbidity on the addition of Silver Nitrate Solution, indicating the absence of more than traces of Chlorides. Excess of moisture may be detected by a loss on drying at 100° C. (212° F.) as described above.

Hydrogen Sulphide.—An aqueous solution (1–20) should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Sodium Phosphate.—An aqueous solution (1–20), after the addition of Ammonia T.S. should not be affected by T.S. of Sodium Phosphate, *P.G.*

Silver Nitrate.—An aqueous solution (1–20) should not undergo any change within 5 minutes on the addition of T.S. of Silver Nitrate, *P.G.*

Potassium Ferrocyanide.—20 c.c. of an aqueous solution (1–20) should not be affected by 0·5 c.c. of T.S. of Potassium Ferrocyanide, *P.G.*

Gutzeit's Test.—5 c.c. of the aqueous solution (1–10) should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Stannous Chloride.—A mixture of 1 gramme of previously dried and powdered Sodium Sulphate, and 3 c.c. of Stannous Chloride T.S. should not assume a dark colour in the course of an hour, *P.G.*

Preparation.

SODII SULPHAS EFFERVESCENS. Effervescent Sodium Sulphate.

Sodium Sulphate, in crystals, 50; Sodium Bicarbonate, in powder, 50; Tartaric Acid, in powder, 27; Citric Acid, in powder, 18; made into granules, the total weight of which is about 100. (1 in 2)

Dose.—60 to 120 grains = 4 to 8 grammes, for repeated administration; for a single administration, ¼ to ½ an ounce = 7·1 to 14·2 grammes.

Not Official.

PULVIS SODII SULPHATIS ET ZINGIBERIS.—Sodium Sulphate, in powder, 60 grains; Ginger, in powder, 5 grains; mix.

To be taken in a small tumbler of warm Water, in the morning.

PULVIS SALIS CAROLINI FACTITII EFFERVESCENS (Effervescent Powder of Carlsbad Salt).—Dried Sodium Sulphate, 11 oz.; Powdered Potassium Sulphate, ½ oz.; Sodium Chloride, 4½ oz.; Sodium Bicarbonate, 54 oz.; Tartaric Acid, 40 oz.; Gluside, 28 grains. Dry separately, reduce to fine powder and mix. —*B.P.C. Formulary* 1901.

Dose.—60 to 120 grains=4 to 8 grammes.

Exsiccated Sodium Sulphate, 9; Sodium Potassium Tartrate, 38; Sodium Chloride 3; Sodium Bicarbonate, 33; Gluside 0·05; Tartaric Acid, *q.s.* to produce 100.—*B.P.C.*

SAL CAROLINUM FACTITIUM.—Dry Sodium Sulphate, 22; Potassium Sulphate, 1; Sodium Chloride, 9; Sodium Bircarbonate, 18.—*Ger.*

This has been incorporated in the *B.P.C.*

Dry Sodium Sulphate 47, Potassium Sulphate 2, Sodium Chloride 15, Sodium Bicarbonate 36.—*Jap.*

SODII SULPHIS.

SODIUM SULPHITE.

$Na_2SO_37H_2O$, eq. 250·38.

Colourless, transparent, efflorescent, monoclinic prisms, having a cooling saline and sulphurous taste. It can be prepared by interaction of Sulphurous Acid and Sodium Carbonate.

It should be preserved in well-closed bottles and kept in a cool place, as both the crystals and aqueous solutions are liable to oxidation on exposure to air.

Solubility.—3 in 4 of Water; insoluble in Alcohol (90 p.c.); 1 in 25 of Glycerin.

Medicinal Properties.—Antiseptic; given with success in fermentative vomiting and dilated stomach due to sarcina ventriculi. Externally as a lotion in parasitic cutaneous affections.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Incompatibles.—Mineral Acids.

Not Official.—Liquor Sodii Sulphitis Benzoicus, Sodium Thiosulphate and Lotio Sodii Hyposulphitis.

Foreign Pharmacopœias.—Official in Mex., Port. and U.S.

Tests.—Sodium Sulphite when gently heated gradually loses its Water of crystallisation, and at a temperature of a little above 100° C. (212° F.) it loses its Water of crystallisation, equivalent to 50 p.c. It answers the tests distinctive of Sodium given under that heading. It dissolves readily in Water, yielding a solution which is usually faintly alkaline towards red Litmus paper. The *U.S.P.* states that it is neutral or feebly alkaline to Litmus paper. It evolves on the addition of Hydrochloric Acid a colourless gas possessing the characteristic pungent odour of burning Sulphur. On the addition of Zinc and Hydrochloric Acid it evolves the characteristic odour of Hydrogen Sulphide, and if a piece of filter paper moistened with Lead Acetate Solution be suspended in the neck of the tube it acquires a black colour. Iodine Solution added to an acidified solution is instantly decolorised. It is officially required to contain not less than 97·3 nor more than 102·3 p.c. of pure crystallised Sodium Sulphite as volumetrically determined by the method given below under the heading of Volumetric Determination. The *U.S.P.* requires that it should contain in the uneffloresced and air-dried condition not less than 94 p.c. of pure Sodium Sulphite as volumetrically determined by the method also given below in small type under the heading of Volumetric Determination. The salt is not official in the *P.G.*

The more generally occurring impurities are Arsenic, Copper, Lead and Iron, Chlorides, Sulphates and Thiosulphates. The *B.P.* includes only a test for the latter, the *U.S.P.* tests for the heavy metals and Thiosulphates. Arsenic, Copper, Lead and Iron, if present, may be detected by the Hydrogen Sulphide test described below. The strongly acidified aqueous solution of the salt should yield no decided turbidity on the addition of Silver Nitrate T.S., indicating the absence of more than traces of Chlorides. It should not yield a pronounced turbidity on the addition of Barium Chloride Solution to an aqueous solution strongly acidified with Hydrochloric Acid, indicating the absence of more than traces of Sulphates. The aqueous solution when treated with Hydrochloric Acid should not become cloudy, indicating the absence of Thiosulphate. The *U.S.P.* employs diluted Nitric Acid as a test for the absence of Thiosulphate, when heated sufficiently to expel the gases, no turbidity should appear.

Time-limit Test.—A solution of 1 gramme in 20 c.c. of Diluted Hydrochloric Acid after heating sufficiently to expel the Sulphur Dioxide, and restoring the solution to its orignal volume, should not respond to the time-limit test for heavy metals, *U.S.P.*

Volumetric Determination.—A solution of 1 gramme of the salt in 50 c.c. of Water should decolorise not less than 77·7 nor more than 81·7 c.c. of Volumetric Solution of Iodine, *B.P.* If to 50 c.c. of Tenth-normal Iodine Volumetric Solution measured from a burette into a glass-stoppered vial (of about 100 c.c. capacity), 0·5 gramme of the finely-powdered crystals of Sodium Sulphite be added, after solution has taken place, not more than 12·45 c.c. of Tenth-normal Volumetric Sodium Thiosulphate Solution should be required to discharge the colour of the solution, *U.S.P.*

Not Official.

LIQUOR SODII SULPHITIS BENZOICUS. — Sodium Sulphite, 30; Benzoic Acid, 14; Water, 500. An **Antiseptic solution,** recommended by Heckel.

SODIUM THIOSULPHATE (Sodium Hyposulphite $Na_2S_2O_3, 5H_2O$, eq. 246·44).—Colourless transparent monoclinic prisms, possessing a cooling and somewhat bitter, sulphurous taste. Soluble 5 in 3 of Water; insoluble in Alcohol (90 p.c.). It is seldom used internally as a medicinal agent, but on account of its poisonous influence on the sarcina ventriculi which attends yeasty vomiting it has been employed in that complaint. Externally in the form of a 12½ p.c. solution it has been used in parasitic diseases. It is used for removal of stains produced by Silver salts and in volumetric analysis.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Foreign Pharmacopœias.—Official in Fr., Ger., Swiss and U.S.

Lotio Sodii Hyposulphitis.—Sodium Hyposulphite, 1 drm.; Water, to 1 fl. oz.—*St. John's.*

SODII SULPHOCARBOLAS.

SODIUM SULPHOCARBOLATE.

$NaC_6H_4(OH)SO_3,2H_2O$, eq. 230·44.

Colourless, translucent, slightly efflorescent rhombic crystals, possessing at first a saline and subsequently a slightly bitter taste. It may be prepared from Para-phenol-sulphonic Acid obtained by dissolving Phenol in excess of Sulphuric Acid, by converting it into a Sodium salt.

It should be kept in well-stoppered glass bottles and in a cool atmosphere, as it has a tendency to effloresce in dry air.

The Sulphocarbolates used in medicine are defined as the salts of Para-phenol-sulphonic Acid. The action of Sulphuric Acid upon Carbolic Acid results in a mixture of Para- and Ortho-phenol-sulphonic Acids, the proportion of the latter being less the higher the temperature, and the longer continued the contact. To eliminate the Ortho salt further purification is necessary.

Solubility.—1 in 6 of Water; 1 in 150 of Alcohol (90 p.c.); 1 in 5½ of Glycerin.

Medicinal Properties.—Antiseptic, given in cases of flatulence, fermentative dyspepsia, and other conditions in which Carbolic Acid is used.

Dose.—3 to 15 grains = 0·2 to 1 gramme.

Incompatibles.—Ferric salts.

Foreign Pharmacopœias.—Official in Jap. and U.S. (Sodii Phenolsulphonas).

Tests.—Sodium Sulphocarbolate when heated at a temperature slightly above 100° C. (212° F.) loses its Water of crystallisation, equivalent to 15·5 p.c. When more strongly heated it evolves inflammable vapours possessing a characteristic odour of Phenol, and when ignited leaves a residue of Sodium Sulphate, equivalent to 30·6 p.c. of its original weight. This residue answers the tests distinctive of Sodium given under that heading, and when dissolved in Water yields with Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. The salt dissolves readily in Water, yielding a solution which is neutral in reaction towards Litmus paper. A diluted aqueous solution of the salt yields on the addition of Ferric Chloride T.S. a violet coloration. The *B.P.* does not state what percentage of the pure salt it should contain, nor does it include a method of determination. The *U.S.P.* requires that it should contain not less than 99 p.c. of pure crystallised Sodium Para-phenol-sulphonate, and, although it does not indicate a direct determination to be made, states that the residue of Sodium Sulphate left on ignition should amount to 30·6 p.c.

The more generally occurring impurities are Arsenic, Copper, Lead, Iron and Sulphates. The presence of Arsenic may be ascertained by the modified Gutzeit's test or by the test with Hydrogen Sulphide described below. The latter test when applied either in solution slightly acidified with diluted Hydrochloric Acid or in a solution rendered alkaline with Ammonia, serving to detect also Copper, Lead and Iron. The aqueous solution of the salt should not at once be rendered turbid by Barium Chloride Solution, indicating the absence of Sulphates. The *U.S.P.* states that a diluted solution of the salt (1 in 100) remains clear on the addition of Barium Chloride T.S. The *B.P.* states that it may be distinguished from Salicylate by not yielding a yellowish-brown precipitate with Uranium Nitrate Solution. The criticisms on this latter test will be found under the headings Acidum Salicylicum, Sodii Salicylas.

Time-limit Test.—The aqueous solution of the salt (1–20), slightly acidulated with Hydrochloric Acid, should not respond to the time-limit test for heavy metals, *U.S.P.*

Not Official.

SODII SULPHOVINAS.

SODIUM SULPHETHYLATE.

Translucent, hexagonal crystals, or as a white, granular powder; very hygroscopic, and should be kept in well-stoppered bottles. It is soluble in Water, in dilute Alcohol and in Glycerin. Used as a mild aperient.

Dose.—½ to 1 oz. = 14·2 to 28·4 grammes.

Not Official.

SODII TAUROCHOLAS.

A yellow or yellowish-brown, amorphous, granular, hygroscopic powder; or a brown or blackish-brown, sticky, resinous mass. Soluble 2 in 1 of Water, partially soluble in Alcohol (90 p.c.). It is best prepared from pig's bile.

It should be kept in well-closed bottles and in a cool place.

Given in gouty obesity and dyspepsia, 4 grains immediately after each meal. The **pills** should be coated with Keratin.

Dose.—2 to 6 grains = 0·13 to 0·4 gramme made into **pill** with Alcohol (60 p.c.).

Tests.—Sodium Taurocholate on ignition yields a carbonaceous residue, possessing, when dissolved in Water, a strong alkaline reaction towards red Litmus paper, and effervesces on the addition of Hydrochloric Acid. It answers the tests distinctive of Sodium given under that heading. The salt dissolves readily in Water, yielding a solution which affords a precipitate on the addition of Ammonia Solution and basic Lead Acetate. Taurocholic Acid may be determined by the amount of Sulphur which it contains. A weighed quantity of the salt is moistened with fuming Nitric Acid and evaporated to dryness on a water-bath, the residue is dissolved in Water, the solution filtered and precipitated by the addition of Barium Chloride Solution; when the precipitate is filtered off, washed, dried, ignited and weighed; 1 part of Barium Sulphate corresponding to 2·16 parts of Taurocholic Acid.

Acidum Taurocholicum (Taurocholic Acid) forms deliquescent silky needles, readily soluble in Water and in Alcohol (90 p.c.).

Sodii Glycocholas occurs together with the above salt in ox bile. It may be obtained in the form of stellate needles. It is given in gouty obesity and dyspepsia, and has been found to possess considerable cholagogue action.

Dose.—2 to 10 grains = 0·13 to 0·65 gramme.

Not Official.

SODII VANADAS.

White or yellowish-white, odourless, granular powder, soluble 2 in 1 of Water; insoluble in Alcohol (90 p.c.).

Stimulates the gastric mucosa, increases the appetite and improves the general condition.—*B.M.J.E.* '01, ii. 88; *C.D.* '02, i. 638.

Dose.—$\frac{1}{64}$ to $\frac{1}{25}$ grain = 0·001 to 0·0027 gramme.

Iron Meta-vanadate, a dark, greyish-brown powder, insoluble in Water and in Alcohol (90 p.c.); and **Lithium Meta-vanadate,** a yellowish-white crystalline powder, soluble in Water, have also been prepared.

SOLUBILITY.

The importance of the subject of solubility to medical men was recognised as far back as 1864, by the late Peter Squire, and consequently this has been a feature of Squire's *Companion* to the *B.P.* since the first edition. The several paragraphs appearing under this title are probably of more use to the prescriber and dispenser than any others that appear in a book of this kind. The prescriber is constantly wishing to know whether a given substance will dissolve in some liquid which he desires to use, and to what extent. It is obvious that an error stating the substance to be more soluble than it really is causes more trouble and dissatisfaction than an error in the opposite direction, but the figures should at least be approximately correct. Prior to 1885 very few substances were given solubility figures in the *B.P.*, but subsequently these were very much enlarged.

Figures for the solubility of the various substances have been given in the *Companion* since its first issue in 1864, and these have been revised and supplemented from time to time in subsequent editions, from experiments made for that purpose. In most instances the figures have been ascertained by adding the solid substance in fine powder to a liquid, and shaking it at intervals during 3 days at a temperature between 58° and 62° F. (14·4° and 16·6° C.). They represent the weight of a solid in grammes, and the measure of a fluid in c.c. Some liquids are stated to be miscible in all proportions; this has been ascertained by adding to 5 c.c. of one fluid, small quantities of the other fluid, $\frac{1}{10}$ c.c. at first, and afterwards $\frac{1}{2}$ c.c. until 20 c.c. have been added, shaking the mixture after each addition, the temperature of the mixture being kept inside the limits given above. At the instance of the Pharmacopœia Committee of the General Medical Council a large number of experiments were made in the Research laboratory of the Pharmaceutical Society, with a view to determining the accuracy or otherwise of the solubilities of chemicals mentioned in the British Pharmacopœia, and the results were fully reported and a comparison made with authoritative statements.—*P.J.* '00, ii. 190; '01, i. 774, 806; '02, i. 510, 532, 551. These reports have been closely criticised and compared with

Squire's *Companion* figures in a series of papers by the author and C. M. Caines, communicated to the *Pharmaceutical Journal* and to the *Chemist and Druggist.*

Out of a number of determinations, amounting in the aggregate to 91 figures, 74 are almost identical, 12 are within the range of individual experimental error and variations in commercial samples. In 3 cases Squire's *Companion* figures represent the solubility in Alcohol (88·7 p.c.) of the *B.P.* '85, instead of the Alcohol (90 p.c.) in the *B.P.* '98, and in the remaining 2 instances the Research laboratory figures are shown to be incorrect.—*C.D.* '02, ii. 944; '05 i. 783; *P.J.* '03, i. 65; '05, i. 720. The concluding report from the Research laboratory on the solubility of chemical substances mentioned in the British Pharmacopœia (*P.J.* '03, ii. 881, 945) states that the further experiments confirm the results obtained by Squire and Caines. A short reference also appears under the individual heading of each substance, and will be found in the large type under Ammonii Phosphas and Zinci Sulphocarbolas.

In the Continental Pharmacopœias solubility figures are usually expressed in parts by weight, and this fact is frequently overlooked when such figures are noted by other workers. In the case of liquids lighter or heavier than Water the difference may be considerable. For instance, in a communication from the Research laboratory (*P.J.* '03, ii. 946), 'A comparison with authoritative statements,' shows an apparent discrepancy between the figures given in the British and German Pharmacopœias for the solubility of Phenacetin in Alcohol (90 p.c.) 1 in 20 and 1 in 16 respectively, whereas the British being given by volume and the German by weight, the figures are in perfect accord. It would have been advisable (*P.J.* '05, i. 720) to insert the sp. gr. of the menstruum and the words 'by weight' against the Continental authority. The figures given in the *8th Decennial Revision of the U.S.P.* represent those obtained at a temperature of 25° C. (77° F.). It is stated in the preface that this temperature was adopted for solubilities after much discussion, because it is believed that it will be generally more satisfactory throughout the United States than the former temperature of 15° C. (59° F.); the average temperature of laboratories and stores in the United States throughout the year being nearer 25° C. (77° F.) than 15° C. (59° F.). The above requires to be carefully noted, more particularly in instances where comparisons are being made between figures appearing in books of recognised standing, and more especially in books of reference where the figures are not the result of actual experiment, but consist of a mere compilation. An instance readily occurs in the case of a recently published text-book: it had evidently been held necessary, where figures for the solubility of an individual substance in a certain menstruum were not available in one book, to incorporate figures obtained from another reliable source, and for the accuracy and uniformity of the system the importance of the above caution cannot be over-estimated. Thus figures for the solubility of Terpene Hydrate, 1 in 280 of Water, 1 in 14 of Alcohol (90 p.c.), 1 in 46 Alcohol (60 p.c.), 1 in 32 boiling Water, 1 in 2 of boiling Alcohol, 1 in 100 of Ether, and 1 in 200 of Chloroform may be of considerable utility with a definite knowledge that they are the results of determinations made at two different temperatures, but when they are definitely stated all to refer to determinations made at 15·5° C. (60° F.), whereas in reality they are the result of two different systems, their misleading nature is apparent. The solubility strength of the menstruum used is also a matter of importance. The solubility of some official substances has been shown (*P.J.* '05, i. 720) to vary considerably where Alcohol (88·7 p.c.) of *B.P.* 1885 or Alcohol (90 p.c.) of the *B.P.* 1898 is used as a menstruum, how much more so then is the solubility likely to vary when Alcohol (94·9 p.c.) of the *U.S.P.* is mistaken for Alcohol (90 p.c.) of the *B.P.* Again the Ether official in the *B.P.* refers to Ether, sp. gr. 0·735. Ether (*U.S.P.*) refers to an Ether corresponding to the sp. gr. 0·720 of the *B.P.*, which is another point likely to make a considerable difference, as will be seen by a reference to the note appearing under the solubility of Citric Acid and Tartaric Acid. In addition to substances of official origin, it is frequently necessary to consult figures for the determinations of substances of unofficial origin. A very large number of such determinations have been carried out in the author's laboratory, and the results of these determinations have been incorporated in a series of papers appearing in the pharmaceutical press (*C.D.* '05, i. 783; *P.J.* '05, i. 720, 784).

Not Official.

SOMATOSE.

A light, white or greyish powder, stated to be prepared from fresh meat; soluble in Water, and consisting of a mixture of deutero- and hetero-Albumoses.

Denaeyer states that it is neither Albumose nor a peptone, but has the characters of an alkali-albumen. This statement is partially confirmed by Allen.

A true meat nutrient, possessing restorative and stimulating powers, being well borne by delicate patients. Has a favourable effect on general metabolism. Produces no irritant effect on the kidneys and it never gives rise to albuminuria, albumosuria or peptonuria.—*L.* '99, ii. 885.

Doses of 12 grains, useful in secondary syphilis, and in the anæmia caused by malaria.—*B.M.J.E.* '99, i. 16.

Recommended in anæmia, in intestinal disorders, and in dyspepsia.

Liquid Somatose is given in teaspoonful doses to adults.

Iron Somatose.—Is a light brown, almost tasteless powder, soluble in aqueous liquids. It contains 2 p.c. of Iron, and has been recommended in chlorosis. **Milk Somatose** has also been introduced.

Not Official.

SOZOIODOL.

DI-IODOPARAPHENOLSULPHONIC ACID.

A white, shining, crystalline powder, containing Iodine about 52 p.c., Carbolic Acid 20 p.c., and Sulphur 7 p.c., preferably used in the form of its salts. When required in solution, the **Sodium** salt is most applicable, dissolving 1 in 14 of Water or Glycerin. The **Potassium** salt, soluble 1 in 100 of Water, is preferable as a **dusting powder,** or in **ointments.** Solution of **Zinc** salt, 1 to 3 p.c., is suitable for **injection.**

Medicinal Properties.—A substitute for Iodoform.

It is recommended locally in nasal and pharyngeal disorders, and as an application of great energy in parasitic skin affections.—*B.M.J.* '89, ii. 42; *T.G.* '89, 132; '91, 592. In aural and nasal affections.—*L.* '94 i. 1636; *B.M.J.E.* '94, i. 99.

Sozoiodol cotton and **gauze** containing 5 and 10 p.c.

HYDRARGYRI SOZOIODOLAS (Mercury Sozoiodol).—A fine, orange-yellow, amorphous powder, almost insoluble in Water, insoluble in Alcohol (90 p.c.).

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from contact with the air and light.

Has been employed in syphilis and in psoriasis, chiefly by hypodermic injection (*see* below).

The injections of this salt are stated to be less painful than those of Mercuric Chloride.—*L.* '01, ii. 522; '03, i. 785; *B.M.J.* '03, i. 656.

Tests.—Mercury Sozoiodolate, although almost insoluble in Water, dissolves in Sodium Chloride Solution. 0·5 of a gramme with 1·5 grammes of Sodium Chloride should dissolve leaving only a faint turbidity. It contains theoretically 32·0 p.c. of metallic Mercury, which may be determined by distillation with Lime. A solution of 0·1 of a gramme in 1 c.c. of Nitric Acid and 9 c.c. of Water should be rendered only faintly turbid on the addition of Silver Nitrate solution, indicating the absence of Chlorides. A solution 0·2 of a gramme of the preparation dissolved in 20 c.c. of Water by the aid of a little Hydrochloric Acid should neither yield a distinct turbidity on the addition of Barium Nitrate Solution, nor on the addition of diluted Sulphuric Acid, indicating the absence of Sulphates and Barium salts. When ignited with free access of air it should leave no weighable residue.

INJECTIO HYDRARGYRI SOZOIODOLATIS HYPODERMICA.—Mercury Sozoiodol, 5 grains; Sodium Iodide, 10 grains; Distilled Water, 200 minims. Inject 10 to 15 minims = 0·6 to 0·88 c.c.—*Lock.*

Not Official.

SPERMIN.

DR. BROWN-SEQUARD'S ORCHITIC FLUID.

Full details regarding its preparation and uses are published *B.M.J.* '93, i. 1145, 1212, with an editorial article p. 1279; *B.M.J.E.* '94, ii. 52, 56; *T.G.* '93, 110.

In the form of an essence, 20 drops taken 3 times a day, in the treatment of abnormalities of frequency and rhythm of the pulse.—*B.M.J.E.* '02, i. 23; *L.* '02, i. 326.

SPIRITUS.

SPIRIT.

All saccharine substances which have undergone the vinous fermentation contain Alcohol, which can be separated by distillation. The various kinds of alcoholic liquids are distinguished by differences in flavour and colour.

When Alcohol is distilled with aromatic substances containing volatile Oil, part of the Oil is carried over by the alcoholic vapour, and condenses along with it.

All the official Spirits, except Brandy, are prepared with Alcohol (90 p.c.).

SPIRITUS ÆTHERIS NITROSI.

SPIRIT OF NITROUS ETHER.

B.P.Syn.—SWEET SPIRIT OF NITRE.

A transparent pale yellow, or greenish-yellow, mobile, volatile and inflammable liquid.

The *B.P.* describes Spirit of Nitrous Ether as an alcoholic solution containing Ethyl Nitrite, Aldehyde, and other substances; the *U.S.P.* describes it as an alcoholic solution of Ethyl Nitrite ($C_2H_5NO_2$), yielding when freshly prepared not less than 4 p.c. of Ethyl Nitrite; the *P.G.* gives no description.

It should be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere, and should be exposed as seldom as possible to contact with the air and light.

Medicinal Properties.—Stimulant, diaphoretic, diuretic, and antipyretic. Useful in dropsy of renal origin, but is contra-indicated in acute nephritis. Being a nitrite, it is sometimes used in asthma, angina pectoris, and dysmenorrhœa. *See* also Medicinal Properties of Liquor Ammonii Acetatis.

Dose.—20 to 40 minims = 1·2 to 2·4 c.c., for repeated administration; for a single administration, 60 to 90 minims = 3·6 to 5·4 c.c.

Incompatibles.—Potassium Iodide, Ferrous Sulphate, Tincture of Guaiacum, Gallic and Tannic Acids, Antipyrine and Salicylates.

Prescribing Notes.—*When prescribed with Potassium Iodide, separation of Iodine may be prevented by previously neutralising the free acid in Spiritus Ætheris Nitrosi with Potassium or Sodium Bicarbonate, or the Carbonates. The* *incompatibility of Antipyrine and Spiritus Ætheris Nitrosi may be overcome by prescribing them in alkaline solution.*

The measure of gas evolved on the addition of Potassium Iodide solution is a measure of the acidity of the Spiritus Ætheris Nitrosi under examination. It should not amount to much more than a third of the total gas volume registered.

Foreign Pharmacopœias.—Official in Belg. (Æther Nitricus Alcoholicus), sp. gr. 0·84 to 0·86; Dutch (Nitris Æthylicus cum Spiritu), sp. gr. 0·84 to 0·85; Spiritus Ætheris Nitrosi.—Ger., sp. gr. 0·84 to 0·85; Jap., sp. gr. 0·84 to 0·85; Russ., sp. gr. 0·84 to 0·85; Swiss, sp. gr. 0·845 to 0·855; U.S., sp. gr. about 0·823 at 25° C. (77° F.). Ital. (Etere Nitroso Officinale), sp. gr. 0·85; Mex. (Eter Nitroso Alcoholizado); Norw. (Æther Nitrosus Spirituosus), sp. gr. 0·84 to 0·85; Port. (Acido Azotico Alcoolisado); Span. (Espiritu de Nitro Dulce).

Under the name of **'Itrosyl'** a concentrated form of Nitrous Ether has been introduced, 1 fl. oz. of which mixed with 19 fl. oz. of Alcohol (90 p.c.) is stated to be equivalent to Spiritus Ætheris Nitrosi.

Tests.—Spirit of Nitrous Ether has a sp. gr. of about 0·840. The *B.P.* says 0·823 to 0·842; the *U.S.P.* about 0·823 at 25° C. (77° F.); the *P.G.* 0·840 to 0·850. When freshly prepared it is neutral in reaction towards Litmus paper, but on keeping it gradually develops acidity, and then has an acid reaction towards blue Litmus paper. When carefully poured upon Ferrous Sulphate Solution acidified with Sulphuric Acid a dark brown or blackish-brown coloration is developed at the junction of the two fluids. The *U.S.P.* states that, if a test-tube be half filled with the spirit and put into a water-bath heated to 65° C. (149° F.) until it has acquired this temperature, the spirit should boil distinctly upon the addition of a few small pieces of broken glass. It is officially required to contain, when freshly prepared, 2½ p.c. w/w of Ethyl Nitrite, and even when it has been kept for some time, and the vessel which contains it has been occasionally opened, it should yield 2 p.c. w/w of Ethyl Nitrite, or a minimum of 1¾ p.c. as gasometrically determined by measuring the volume of Nitric Oxide gas evolved on treating it with Potassium Iodide Solution and Diluted Sulphuric Acid, as described below under the heading of Gasometric Determination. The *U.S.P.* requires that it shall contain not less than 4 p.c. of Ethyl Nitrite as gasometrically determined by the process given in small type under the heading of Gasometric Determination. The *P.G.* does not include a method of assay. Allen's method consists in treating the sample with an acidulated solution of Potassium Iodide and measuring the Nitric Oxide liberated. A nitrometer is filled with strong brine, 5 c.c. of Spirit of Nitrous Ether is introduced, followed by 5 c.c. of a strong Potassium Iodide solution, and then by 5 c.c. of diluted Sulphuric Acid. The nitrometer is agitated briskly at intervals, after 5 minutes the liquid is adjusted to the same level, the volume of gas is read off. To calculate the percentage of real Ethyl Nitrite the following data is required:—

1. The sp. gr. of the sample to be examined.
2. 23·55 c.c. of Nitric Oxide, measured at ordinary pressure and temperature, weigh 0·03 gramme.
3. 30 parts by weight of Nitric Oxide are equivalent to 75 parts by weight of Ethyl Nitrite.

The measure of gas evolved on the addition of Potassium Iodide is a measure of the acidity of the Spiritus Ætheris Nitrosi under examination. It should not amount to much more than a third of the total gas volume registered. The following process was suggested (*A.J.P.* '98, 273) for the assay of this preparation. Into a 100 c.c. flask provided with a loosely-fitting stopper place successively 10 c.c. of Distilled Water, 5 c.c. of a cold saturated aqueous Potassium Chlorate Solution, 5 c.c. of the sample to be tested, and 5 c.c. of a 10 p.c. Nitric Acid Solution. Insert the stopper and shake frequently for 30 minutes, then add 10 c.c. of Tenth-normal Volumetric Silver Nitrate Solution and shake briskly for 1 minute, add 10 drops of Ferric Ammonium Sulphate Solution, and titrate the excess of Tenth-normal Volumetric Silver Nitrate Solution with Tenth-normal Volumetric Potassium Sulphocyanate Solution. Each c.c. of Tenth-normal Volumetric Silver Nitrate Solution consumed corresponds to 0·0225 gramme of Ethyl Nitrite. This process was claimed to give higher and more correct results than Allen's nitrometer process, but the nitrometer process was never put forward as an absolutely true one, but as one by which Ethyl and other Nitrites might be estimated with approximate accuracy, and it has fulfilled its expectations admirably.

The more generally occurring impurities are free acid and Aldehyde. The *B.P.* requires that, when shaken with Sodium Carbonate, no effervescence, or only a very feeble effervescence, should occur. The *U.S.P.* requires that it should not effervesce when a crystal of Potassium Bicarbonate is dropped into it. The *P.G.* fixes a limit of acidity, requiring that 10 c.c. shall not possess an acid reaction after the addition of 0·2 c.c. of Normal Potassium Hydroxide, but does not state to what indicator of neutrality; presumably towards Litmus. As regards tests for Aldehyde, the *B.P.* requires that, when a measured quantity of 10 c.c. of the spirit is mixed with 5 c.c. of Volumetric Sodium Hydroxide Solution and 5 c.c. of Water, it should assume a yellow colour, which should not become brown on standing 12 hours. The *U.S.P.* includes a somewhat similar test though less stringent, requiring that the mixture should not turn a decided brown within 12 hours; the *P.G.* does not include a test for Aldehyde.

Gasometric Determination.—If 1 volume of the spirit is agitated briskly at intervals during 5 minutes in a nitrometer filled with saturated brine solution, with 1 volume of Potassium Iodide Solution and 1 volume of Diluted Sulphuric Acid, it should, when recently made, yield at the normal temperature [15·5° C. (60° F.)], and pressure (30 in. or 760 mm. of Mercury), at least 6¼, but not more than 7, volumes of Nitric Oxide gas, *B.P.*

A quantity of about 30 grammes of the spirit (which has been previously shaken with 0·5 gramme Potassium Bicarbonate, is transferred to a graduated measuring flask of 100 c.c. capacity and its weight accurately determined. It is then diluted with sufficient Alcohol (94·9 p.c.) to produce 100 c.c. and thoroughly mixed. A measured quantity of 10 c.c. of this alcoholic solution is introduced into a nitrometer filled with a saturated brine. 10 c.c. of Potassium Iodide Solution is then introduced, and this in turn followed by 10 c.c. of Normal Volumetric Sulphuric Acid. The volume of gas evolved is read off when the volume of gas has become constant, usually within 30 to 60 minutes. The number of c.c. of gas is multiplied by 0·307, and the product divided by one-tenth the original weight of the Spirit of Nitrous Ether taken. At the standard temperature and pressure the quotient will represent the percentage of Ethyl Nitrite in the liquid.

The temperature correction is $\frac{1}{3}$ of 1 p.c. of the total percentage found, for each one degree, additive if the temperature is below, subtractive if above 25° C. (77° F.). The barometric correction is $\frac{4}{30}$ of 1 p.c. for each mm., additive if above, subtractive if below 760, *U.S.P.*

LIQUOR ETHYL NITRITIS. SOLUTION OF ETHYL NITRITE.

A transparent, colourless, or pale yellow, mobile, volatile, inflammable liquid. It consists of a mixture of 95 parts by volume of Absolute Alcohol with 5 parts by volume of Glycerin, and contains, when freshly made, 3 p.c. by weight, and even after keeping for some time not less than 2½ p.c. by weight of Ethyl Nitrite.

It should be kept in well-stoppered small glass bottles of a dark amber tint in a cool atmosphere and protected as far as possible from exposure to air and light.

The reasons for its introduction will be found, *P.J.* (3) xviii. 861.

Medicinal Properties.—Similar to those of the other more slowly acting Nitrites.

Dose.—20 to 60 minims = 1·2 to 3·6 c.c.

Experiments testing the physiological activity of the *B.P.* preparation compared with a 2·5 p.c. solution of the pure Ethyl Nitrite showed that both were practically identical.

Tests.—Solution of Ethyl Nitrite has a sp. gr. of about 0·825, the *B.P.* states 0·823 to 0·826. It is not official in either the *U.S.P.* or the *P.G.* When carefully poured on to the surface of a cold Solution of Ferrous Sulphate acidified with Sulphuric Acid, a dark brown or blackish-brown ring is developed at the junction of the two liquids. It is officially required to yield, when freshly prepared, at least 7·6 volumes of Nitric Oxide gas, and a solution which has been kept some time, and the vessel containing it having been occasionally opened, is required to possess at least five-sixths of the strength indicated, as gasometrically determined by shaking for 5 minutes in a brine-charged nitrometer, 1 volume of the solution with 1 volume of Potassium Iodide Solution and 1 volume of Diluted Sulphuric Acid.

The more generally occurring impurities are free acid and Aldehyde. The solution should not effervesce when shaken carefully with Sodium Bicarbonate, indicating the absence of free acid. A measured quantity of 10 c.c., when mixed with an equal volume of a mixture of equal parts of Volumetric Sodium Hydroxide Solution and Water, should not assume a yellow colour, indicating the absence of Aldehydes.

Not Official.

SPIRITUS FRUMENTI.

WHISKY.

The term Whisky is here intended to apply to an alcoholic liquid obtained from fermented Grain by distillation and the product of the Pot Still. Whisky is described in the *U.S.P.* as an alcoholic liquid obtained by the distillation of the fermented mash of Grain, such as Indian Corn, Rye, Wheat and Barley, or other mixtures, but no mention is made as to whether it should be the product of the Pot or Patent Still; it is, however, required to be at least 4 years old. Allen states in the majority of cases a judicious admixture of raw and malted Grain is employed; other things being equal, the spirit from malted Grain is the most valuable and contains least Fusel Oil. It has recently been held as the result of a magisterial decision that only Pot Still Whisky distilled in Ireland and Scotland could be legally sold as Whisky, thus eliminating Patent Still Whisky. An appeal lodged against this decision resulted in an equal division of opinion on the subject, and the case was referred for re-hearing. The Royal Commission appointed to investigate not only the point whether Pot or Patent Still Whisky should be the legal representative of the article, but also the whole position with regard to the subject, in an interim report arrives at the following conclusions:—(1) That no restrictions should be placed upon the processes of, or apparatus used for the distillation of any Spirit to which the term Whisky may be applied as a trade description. (2) That the term Whisky having been recognised in the past as applicable to a potable Spirit manufactured from (i) Malt, or (ii) Malt and other malted Barley, or other cereals, the application of the term Whisky should not be denied to the product manufactured from such materials. Whisky improves greatly on keeping; when new it is colourless or nearly so, but by storing in Sherry casks (a favourite method of imparting flavour to Whisky) it acquires colour, and then contains sensible traces of Tannin, Sugar, etc. The smoky flavour of Irish Whisky is due to the fact that the Malt used has been dried upon kilns in which Peat is used for fuel, but is sometimes imitated by adding 1 or 2 drops of Creosote to the gallon of spirit. It is doubtful whether Fusel Oil is ever purposely added to Whisky, but it is almost invariably present in greater or less quantity, and has been stated to be the cause of objectionable symptoms produced by new spirit. Allen is of opinion that as the Amyl Alcohol in spirits rarely exceeds 0·1 p.c. or 70 grains per proof gallon, it seems highly improbable that it could produce the local effects sometimes attributed to it; its effect on the general system has probably been greatly exaggerated. It is a noticeable fact (*B.M.J.* '03, ii. 1645) that whereas years ago 70 p.c. of the Whisky was Malt Whisky and 30 p.c. Grain or Patent Spirit, the proportions are now reversed.

Tests.—Whisky has a sp. gr. of about 0·930. The *U.S.P.* states it should not be more than 0·945 nor less than 0·924 at 15·6° C. (60° F.).

Absolute Alcohol.—It contains from 50 to 64 p.c. w/v of Absolute Alcohol. The *U.S.P.* says from 44 to 55 p.c. w/v corresponding to 37 to 47·5 p.c. by weight of Absolute Alcohol. The Alcohol may be determined by distilling a known volume of the Whisky and ascertaining the sp. gr. of the distillate when made up to a definite volume. The percentage of Absolute Alcohol by weight, corresponding to this gravity, may be found by reference to an Alcohol table. In calculating the result on the original Whisky it is necessary to take into consideration the sp. gr. of the sample and the volume used for the distillation.

Extractive Matter.—The amount of extractive matter rarely amounts to more than 100 grains per gallon, equivalent to about 0·15 p.c. The *U.S.P.* states that the limit of residue when dried at 100° C. (212° F.) is 0·5 p.c. w/v, and this residue is required to possess no sweet or distinctly spicy taste. The amount may be determined by evaporating a definite volume (25 c.c.) to dryness on a water-bath, drying the residue at a temperature of 100° C. (212° F.) till constant in weight, and when cool, weighing.

Total Acid.—The total acid may vary from 0·01 p.c. to 0·083 p.c., and may be determined by titrating a measured quantity of 25 c.c. of the sample with Tenth-normal Barium or Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. The *U.S.P.* requires that to render 100 c.c. of Whisky distinctly alkaline to Litmus not more than 1·2 c.c. of Normal Volumetric Potassium Hydroxide Solution should be necessary.

Volatile Acid.—The volatile acid may vary from 0·014 p.c. to 0·072 p.c. w/v. It may be determined by distilling a measured quantity (100 c.c.) almost to dryness, adding 25 c.c. of Water to the residue in the distillation flask and continuing the distillation until reduced to a low bulk. The distillate is titrated with Tenth-normal Volumetric Barium or Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. 1 c.c. of Tenth-normal

Volumetric Barium or Sodium Hydroxide Solution is equivalent to 0·005958 gramme of Acetic Acid. The difference between the number of c.c. of Tenth-normal Volumetric Barium or Sodium Hydroxide Solution required to neutralise the volatile acid, and the calculated number of c.c. of Tenth-normal Volumetric Barium or Sodium Hydroxide Solution required to neutralise 100 c.c. of the original sample represents that necessary for the neutralisation of the fixed acid, and may be calculated into Tartaric Acid. Each c.c. of Tenth-normal Volumetric Barium or Sodium Hydroxide Solution represents 0·007446 gramme of Tartaric Acid.

Esters.—The proportion of esters in Whisky varies from 0·033 p.c. w/v to 0·185 p.c. w/v. They may be determined by distilling a measured quantity of 100 c.c. of the sample in a distillation flask almost to dryness, adding 25 c.c. of Water and again distilling to a volume of about 5 c.c. The free acid in the distillate is neutralised with Tenth-normal Volumetric Barium or Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. A measured quantity of 25 c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution is then added and the contents of the flask boiled under a reflux condenser for 1 hour, cooled, and the excess of Tenth-normal Volumetric Alkali Solution titrated with Tenth-normal Volumetric Sulphuric Acid Solution, still employing Phenolphthalein Solution as an indicator of neutrality. In the event of the specimen containing more Ethers than correspond with this quantity of Sodium Hydroxide Solution, which is at once indicated by the disappearance of the pink colour, a further quantity of the Tenth-normal Volumetric Alkali Solution should be added. The number of c.c. of Tenth-normal Volumetric Sulphuric Acid Solution used is subtracted from the number of c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution added, the difference is calculated into terms of Ethyl Acetate. 1 c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution corresponds to 0·0088 gramme of Ethyl Acetate.

Higher Alcohols.—The higher Alcohols in Whisky vary from 0·082 p.c. w/v to 0·260 p.c. w/v. Various methods have been suggested for the determination of these higher Alcohols, the most reliable and the one now most generally used is the Marquardt process as modified by Allen and Chattaway, and generally referred to as the Allen-Marquardt process. It consists in distilling a measured quantity of 200 c.c. of the specimen to be examined until reduced in volume to 20 c.c. To the residue in the distillation flask are added 50 c.c. of Water and 10 grammes of Sodium Sulphate, and the distillation continued until reduced to 10 c.c.; the mixed distillates are titrated with Tenth-normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. A further measured quantity of 20 c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution is added and the liquid boiled for 1 hour under a reflux condenser, the excess of Tenth-normal Volumetric Sodium Hydroxide Solution is titrated with Tenth-normal Volumetric Hydrochloric Acid Solution. The liquid is now divided into two equal parts, each corresponding to 100 c.c. of the original specimen, and each of which is treated in the following way in order to yield a duplicate determination: A saturated solution of common salt (prepared by saturating Water with clean table salt and adding dilute Sulphuric Acid until the liquid has a distinct acid reaction, and filtering) is added to the liquid until the resulting mixture has a sp. gr. of 1·1 when it is extracted in a separator four times with Carbon Tetrachloride, using 40 c.c. of the Carbon Tetrachloride for the first extraction, 30 c.c. for the second, 20 c.c. for the third, and 10 c.c. for the last extraction. The Carbon Tetrachloride now contains the whole of higher Alcohols and some Ethyl Alcohol. To remove the latter the Carbon Tetrachloride is shaken with 50 c.c. of brine, and after this has been separated it is shaken with 50 c.c. of a saturated Solution of Sodium Sulphate to remove the Chloride. The Carbon Tetrachloride is next treated with an oxidising mixture consisting of 5 grammes of Potassium Bichromate, 2 grammes of strong Sulphuric Acid and 10 c.c. of Water; the oxidation may be carried out in a flask connected with a reflux condenser, or preferably in well-made glass bottles possessing accurately fitting ground glass stoppers: the stoppers being securely tied down and the bottles heated in a water-oven. When the oxidation is performed under a reflux condenser, at least 8 hours boiling is necessary, but when conducted under pressure in stoppered bottles, if shaken frequently, from 3 to 4 hours only is necessary for complete oxidation. The liquid is transferred to a distilling flask, the bottle rinsed with 30 c.c. of Water, the washings transferred to the distilling flask and the liquid distilled until only 20 c.c. remain in the flask. A measured quantity of 80 c.c. of Water is added to the residue and the distillation continued until only 5 c.c. remain. The mixed distillates are now titrated with Tenth-normal Volumetric Barium Hydroxide Solution using Methyl Orange Solution as an indicator of neutrality, shaking the liquid thoroughly after each addition. The amount of alkali required to neutralise the liquid at this stage should not exceed 2 c.c., and generally less is required; a few drops of Phenolphthalein Solution are now added and the titration continued. Each c.c. of Volumetric Barium Hydroxide Solution required in the second stage of the titration corresponds to 0·0088 gramme of higher Alcohols expressed in terms of Amyl Alcohol. The alkali which was added when titrating with Methyl Orange Solution is stated to represent the mineral acid which is distilled. This method has been carefully investigated by Schidrowitz and Kaye (*J.S.C.I.* '02, 815; *Analyst* xxx. 190), who state that 'of the methods examined, that of Allen-Marquardt, with certain minor modifications, is alone capable of giving fairly reliable figures, at any rate where Whisky is concerned, and that we are still inclined to believe that if carefully worked this process is still the most reliable of all those published.' The process has also been criticised (*J.S.C.I.* '06, 1125), in the course of an extended investigation of samples of Whisky for the Western Australian Government it was found that operating upon pure materials no mineral acid was produced as the result of the oxidising mixture alone or from its action upon Carbon Tetrachloride. It was, however, noticed that Valerianic Acid in a similar manner to Acetic Acid had a distinct action upon Methyl Orange Solution, and it is concluded that the titration for mineral acids is unnecessary and introduces errors, and that accurate results may be obtained by observing the following points: (*a*) The shaking out should be performed at a temperature of 15·5° C. (60° F.) or less; (*b*) the oxidation to be conducted in pressure bottles; (*c*) the higher Alcohols should be determined by direct titration only, calculating all acidity as Valerianic Acid.

Aldehyde.—Aldehyde may be detected in the distilled spirit, or if present in very minute proportions in the first fraction of the distillate. 10 c.c. of the distilled spirit may be mixed with 4 c.c. of Schiff's reagent, prepared by mixing 30 c.c. of a 1 in 1000 aqueous solution of Magenta with 20 c.c. of Sodium Bisulphite Solution (sp. gr. 1·31), 3 c.c. of Sulphuric Acid and 200 c.c. of Water.

Furfural.—Furfural may be detected by means of Aniline Acetate, 10 c.c. of the distilled spirit is mixed with 2 c.c. of an Aniline Acetate Solution prepared by dissolving 10 drops of Aniline in 2 c.c. Glacial Acetic Acid.

As a test for the absence of more than a trace of Fusel Oil from grain, the *U.S.P.* requires that if 100 c.c. of Whisky be very slowly evaporated on a dish or water-bath, the last portions volatilised should not have a harsh or disagreeable odour. The absence of added Sugar, Glycerin and aromatic substances, is judged by the character of the residue left on drying as described above. The absence of more than traces of Oak Tannin from casks is assured by the residue being required to dissolve completely in 10 c.c. of cold Water to form a solution which should not be coloured deeper than light green on the addition of a few drops of Ferric Chloride T.S. The *U.S.P.* also requires that if 50 c.c. of Whisky be shaken vigorously in a stoppered flask with 20 c.c. of Kaolin, and filtered, after standing half an hour the filtrate should not be lighter in colour than the Whisky before treatment.

Official in U.S.

Not Official.

SPIRITUS METHYLATUS.

METHYLATED SPIRIT.

The duty-free spirit supplied to 'manufacturers' under a special bond, is a mixture of 9 parts of Alcohol with 1 part of a Wood Naphtha, approved by the Excise. It can also be supplied under a special bond for scientific purposes.

As supplied to 'licensed retailers,' Methylated Spirit is 3 pints of Petroleum Oil added to 100 gallons of the mixture described above. The Petroleum Oil is added, partly to make it more nauseous for drinking, and partly to facilitate its recognition. It becomes turbid when mixed with Water, which quality renders it unsuitable for many purposes to which duty-free spirit has been applied.

Licensed retailers of Methylated Spirit must not sell more than 1 gallon at any one time, and may not keep stock exceeding 50 gallons. They may not sell Methylated Spirit between the hours of 10 p.m. on Saturdays and 8 a.m. on Mondays.

SPIRITUS RECTIFICATUS.

ALCOHOL (90 p.c.).

B.P.Syn.—RECTIFIED SPIRIT.

A transparent, colourless, mobile, volatile and inflammable liquid, having a distinctive spirituous odour and burning taste.

The Alcohol (90 p.c.) of the *B.P.* is described as a liquid containing 90 parts by volume, equivalent to 85·65 p.c. by weight, of Ethyl Hydroxide, C_2H_5OH, eq. 45·7, and 10 parts by volume, equivalent to 14·35 p.c. by weight, of Water, and its official method of preparation is by the distillation of fermented Saccharine liquids. It is only slightly stronger than the Rectified Spirit of the *B.P.* '85, containing, by volume, 1·35 p.c., or by weight 1·65 p.c. more Ethyl Hydroxide. The equivalent to this spirit in the *U.S.P.* is known under the title Alcohol, and it is described as a liquid composed of about 92·3 p.c. by weight, or about 94·9 p.c. w/v of absolute Ethyl Alcohol, and about 7·7 p.c. w/w of Water. The *P.G.* describes it under the heading of Spiritus, and states that 100 parts contain 91·2 to 90 parts by volume, equivalent to 87·2 to 85·6 p.c. by weight.

It should be kept in well-closed vessels and in a cool atmosphere, and it should be kept away from lights or fire.

On mixing Alcohol (90 p.c.) and Water, contraction of volume and rise of temperature occur. When such a mixture is prescribed in the British Pharmacopœia, the cooled liquid should be employed.

It is possible to rectify Alcohol up to 98 p.c., and 95 p.c. is prepared commercially in large quantities.

It may here be noted that although it is illegal for chemists and druggists to sell Rectified Alcohol except upon prescription, the Board of Inland Revenue does not appear to interfere with its sale by them in small quantities not exceeding 8 oz. at a time, for the purposes of medical or scientific research.

Alcohol (90 p.c.) dissolves Camphor, Balsams, Castor Oil, Iodine, Potassium and Sodium Hydroxides, but not the Carbonates.

Medicinal Properties.—Internally a powerful diffusible stimulant, especially cardiac; antipyretic, diuretic, and diaphoretic. Used in some states of acute disease characterised by excessive debility, as in typhoid, acute pneumonia, and influenza, to maintain the strength over the crisis; in chronic wasting diseases as phthisis; in insomnia of old people; during a meal in small quantity, as an aid to digestion and absorption, and to promote appetite, more especially in the aged and feeble and in those exhausted by overwork; in sudden fainting. In acute dyspepsia it is injurious; it may, however, check vomiting, and brandy often checks diarrhœa. In moderation it acts as a food, and saves tissue waste. Large quantities paralyse the gastric secretion, produce gastritis, and ultimately atrophy of the gastric glands. Externally to prevent bed sores and cracked nipples by hardening and disinfecting the skin; it is antiseptic and astringent, and is applied diluted to stop sweating and to produce cold by evaporation; 1 of Alcohol (90 p.c.) and 2 of Camphor Water mixed is a good evaporating **lotion.** Diluted it forms a lotion for erysipelas, erythema, burns, and scalds while the cuticle is entire, and for sprains and recent bruises. As an ingredient of liniments it is rubefacient, it relieves rheumatic and other kinds of pain, and aids the resorption of inflammatory products.

Foreign Pharmacopœias.—Official in all; Fr., Alcool Éthylique à 95 degrés centésimaux.

Tests.—Alcohol (90 p.c.) has a sp. gr. of 0·834. The sp. gr. of the Alcohol official in the *U.S.P.* is about 0·816 at 15·6° C. (60° F.) or 0·809 at 25° C. (77° F.); that official in the *P.G.* 0·830 to 0·834. It readily volatilises, and when ignited burns with a pale blue non-luminous flame. If to a few c.c. of Alcohol 1 or 2 drops of a Potassium Hydroxide Solution (50 p.c.) be added, and then a solution of Iodine drop by drop till the liquid contains a slight but distinct excess of Iodine, and the mixture be warmed to about 60° C. (140° F.), it yields a powerful penetrating odour of Iodoform. When mixed with a small quantity of Solution of Potassium Permanganate and Diluted Sulphuric Acid it is rapidly oxidised, the distinctive odour of Acetaldehyde being evolved. It reduces Potassium Bichromate Solution, yielding similarly an odour of Acetaldehyde, the solution changing to a bright green. It should be miscible in all proportions with Water, the solution should be odourless and free from turbidity.

The more generally occurring impurities are fixed residue, oily or resinous substances, Fusel Oil and allied impurities, Amylic Alcohol and other organic impurities, Aldehyde, Tannic Acid from Oak cask, excess of Aldehyde. It leaves no weighable residue upon evaporation, indicating the absence of fixed residue. It should afford a clear liquid when mixed with Water, indicating the absence of oily or resinous substances. A small quantity of the Alcohol allowed to evaporate on a piece of clean white bibulous paper should leave no unpleasant odour after the Alcohol has completely evaporated, indicating the absence of Fusel Oil and allied impurities. The *U.S.P.* mixes the Alcohol with half its volume of Water and one-tenth of its volume of Glycerin and allows the mixture to evaporate spontaneously. The *P.G.* does not include an evaporation test. The remarks upon the *B.P.* and the *U.S.P.* methods of testing for Fusel Oil and allied impurities are described under Alcohol Absolutus. The *P.G.* requires that, when a mixture of 10 c.c. of spirit and 0·2 c.c. of Potassium Hydroxide Solution (15 p.c.) is evaporated to one-tenth its volume the residue, when supersaturated with Sulphuric Acid, should develop no odour of Fusel Oil. As an additional test for the presence of Amylic Alcohol and readily charred organic impurities, the *U.S.P.* evaporates 25 c.c. spontaneously in a porcelain evaporating dish, carefully protecting the liquid from dust during the evaporation. The evaporation is continued until the surface of the dish is barely moist, on then adding a few drops of colourless concentrated Sulphuric Acid the residue should not produce a red or brown coloration. The *P.G.* performs the test for readily carbonisable organic impurities on the spirit direct without evaporation. In testing for Aldehyde the *B.P.* and *U.S.P.* give practically the same test. The Ammonia test for Tannic Acid and excess of Aldehyde is common to the *B.P.* and the *P.G.*, but is omitted from the *U.S.P.* The *P.G.* includes, in addition, a test with Hydrogen Sulphide which is described below. The *U.S.P.* includes a test for the absence of more than 2 p.c. of Methyl Alcohol. The explanation of this test, given under Alcohol Absolutum and a description of the test itself, is in small type below; it is not given in either the *B.P.* or the *P.G.*

Potassium Hydroxide.—On mixing 10 c.c. of the spirit with 5 c.c. of Potassium Hydroxide T.S. the liquid should not immediately darken in colour, *B.P.*; should not at once assume a yellow colour, *U.S.P.*

Ammonia.—No immediate darkening in colour should occur on the addition of Ammonia T.S. to Alcohol (90 p.c.), *B.P.*; the spirit should not become coloured, *P.G.*

Hydrogen Sulphide.—Spirit should not become coloured by T.S. of Hydrogen Sulphide, *P.G.*

Silver Nitrate.—After exposing 100 c.c. of Alcohol (90 p.c.) with 2 c.c. of Volumetric Silver Nitrate Solution to bright light for 24 hours and decanting the liquid from the black powder formed, no further change should occur when the liquid is again exposed with more of the Volumetric Silver Nitrate Solution, *B.P.*; 10 c.c. of spirit should neither become turbid nor coloured on warming with 5 drops of T.S. of Silver Nitrate, *P.G.*; if 20 c.c. of Alcohol be shaken in a clean, glass-stoppered vial with 1 c.c. of Silver Nitrate T.S., the mixture should not become more than faintly opalescent or acquire more than a faint brownish tint when exposed for 6 hours to diffused daylight, *U.S.P.*

Sulphuric Acid.—A mixture of 10 c.c. of spirit and 0·2 c.c. of Potassium Hydroxide, evaporated to 1 c.c. and supersaturated with diluted Sulphuric Acid, should not have any odour of Fusel Oil, *P.G.* If 5 c.c. of spirit be carefully poured as a layer over 5 c.c. of Sulphuric Acid, no rose-red zone should form at the line of contact, even after standing for some time, *P.G.* If 25 c.c. of Alcohol be allowed to evaporate spontaneously in a porcelain evaporating dish, carefully protected from dust, until the surface of the dish is barely moist, no red or brown colour should be produced upon the addition of a few drops of colourless, concentrated Sulphuric Acid (absence of Amyl Alcohol, or non-volatile, carbonisable, organic impurities), *U.S.P.*

Potassium Permanganate.—The red colour of a mixture of 10 c.c. of spirit and 1 c.c. of Potassium Permanganate T.S. should not become yellow within 20 minutes, *P.G.*

Copper Wire and Resorcin.—1 c.c. of the Alcohol or spirit is transferred to a test-tube of a capacity of about 40 c.c., and sufficient Water added to bring the volume of the liquid to 10 c.c., the test necessitating the proportion of Alcohol in the liquid not being more than about 10 p.c. by volume. 1 metre of No. 18 clean Copper Wire is wound closely round a glass rod 7 mm. thick so as to form a coil about 3 cm. long, the end of the wire being formed into a handle; the coil is heated to redness in a non-luminous flame and plunged, whilst red hot, to the bottom of the liquid in the test-tube and held there for a second or two, withdrawn, and dipped into Water to cool. This operation is repeated five or six times, immersing the test-tube in cold Water to keep it cool. The contents are now filtered into a wide test-tube and boiled very gently; if the odour of Acetaldehyde be perceptible the boiling is continued until the odour has ceased to be clearly distinct; the liquid is cooled, a drop of a 1 in 200 Resorcinol solution added. A portion of this liquid is poured carefully upon the surface of some pure concentrated Sulphuric Acid contained in another test-tube, the tube is allowed to stand for 3 minutes and then slowly rotated, a rose-red coloration should not develop at the point of contact of the two liquids (absence of more than 2 p.c. of Methyl Alcohol), *U.S.P.*

DILUTED ALCOHOL.

Four strengths of diluted Alcohol are official containing respectively, 70, 60, 45 and 20 p.c. of Ethyl Hydroxide by volume. They may be prepared as described in the following paragraphs.

1. Alcohol (70 p.c.).—124⅝ fl. oz. of Alcohol (90 p.c.) mixed with 38⅝ fl. oz. of Water, or 777·7 c.c. of Alcohol (90 p.c.) with 241·6 c.c. of Water; temperature 15·5° C. (60° F.). Sp. gr. 0·8900.
2. Alcohol (60 p.c.).—With 106¾ fl. oz. of Alcohol (90 p.c.) mix 57¼ fl. oz. of Water, or with 666·6 c.c. of Alcohol (90 p.c.) mix 357·8 c.c. of Water; temperature 15·5° C. (60° F.). Sp. gr. 0·9135.
3. Alcohol (45 p.c.).—With 80⅛ fl. oz. of Alcohol (90 p.c.) mix 84¼ fl. oz. of Water, or with 500 c.c. of Alcohol (90 p.c.) mix 526·6 c.c. of Water; temperature 15·5° C. (60° F.). Sp. gr. 0·9436.
4. Alcohol (20 p.c.).—With 35⅝ fl. oz. of Alcohol (90 p.c.) mix 126½ fl. oz. of Water, or with 222·2 c.c. of Alcohol (90 p.c.) mix 791 c.c. of Water; temperature 15·5° C. (60° F.). Sp. gr. 0·9760.

When the sp. gr. of Alcohol is 0·920 it is called **Proof Spirit**; if lighter than this, it is called 'above proof'; if heavier than this, 'under proof'; and the percentage of Water, or of Rectified Spirit, sp. gr. 0·825 (the Inland Revenue Standard), by measure, necessary to be added to any sample of Spirit to bring it to the standard of Proof Spirit, indicates the number of degrees the given sample is above or below proof. Thus, if 100 volumes of a Spirit require 10 volumes of Water to reduce it to proof, it is said to be '10 over proof'; on the other hand, if 100 volumes of Spirit require 10 volumes of Spirit to raise it to proof, the sample is said to be '10 under proof.'

U.S. defines three strengths of Alcohol: **Alcohol Absolutum,** containing 99 p.c. of Alcohol; **Alcohol,** about 94·9 p.c.; and **Alcohol Dilutum,** about 48·9 p.c. All by volume.

Ger. describes four strengths: **Alcohol Absolutus,** containing 99·4 to 99·7 p.c. of Alcohol; **Spiritus,** 90 to 91·2 p.c.; **Spiritus Dilutus,** 68 to 69 p.c.; **Spiritus e Vino,** 37 to 41 p.c. The three former by volume, the last by weight.

The Spirits of the Pharmacopœias are as follows:—

	Sp. gr.	Percentage of Absolute Alcohol by Volume.	
British	0·834	Alcohol 90 p.c. (Spiritus Rectificatus)	90
,,	0·890	,, 70 p.c.	70
,,	0·9135	,, 60 p.c.	60
,,	0·9436	,, 45 p.c.	45
,,	0·976	,, 20 p.c.	20
Austrian	0·830—0·834	Sp. Vini Concentratus	90 to 91·2
,,	0·892—0·896	,, Dilutus	68 to 69
,,	0·935—0·945	,, Cognac	44 to 48
Belgian	0·816—0·820	,, Spiritus	94·09
Danish	0·812—0·816	Spiritus Alcoholisatus	95 to 96
,,	0·831—0·834	,, Concentratus	90 to 91
,,	0·890—0·895	,, Dilutus	68 to 70
Dutch	0·8159	,, Fortior	95
,,	0·8897	,, Dilutus	70
French	0·79433—0·8095	Alcool Éthylique	100
,,	0·816	,, ,, at 95°	95

	Sp. Gr.	Percentage of Absolute Alcohol by Volume.	
German	0·796—0·800	Alcohol Absolutus	99·4 to 99·7
,,	0·830—0·834	Spiritus	90 to 91·2
,,	0·892—0·896	,, Dilutus	68 to 69
,,	0·920—0·924	,, e Vino	(by weight) 37 to 41
Hungarian	0·831—0·834	,,	90 to 91
,,	0·892	,, Dilutus	70
,,	0·919—0·924	Cognac	(by weight) 46 to 50
Italian	0·8346	Alcool 90°	90
,,	0·800	,, Assoluto	99
,,	0·9141	,, 60°	60
Japanese	0·830—0·834	Spiritus	90 to 91·2
,,	0·892—0·896	,, Dilutus	68 to 69
Mexican	0·79	Alcohol Vinico	100
,,		,, at 50°	50
,,		,, 60°	60
,,		,, 80°	80
,,		,, 90°	90
Norwegian	0·8306—0·8339	Spiritus Concentratus	90 to 91
,,	0·9021—0·9044	,, Dilutus	64 to 65
Portuguese	0·834	Alcool at 90°	90
,,	0·850	,, 85°	85
,,	0·905	,, 65°	65
Russian	0·813—0·816	Sp. Vini Alkoholisatus	95
,,	0·831—0·834	,, Rectificatissimus	90
,,	0·888—0·890	,, Rectificatus	70
,,	0·952—0·955	,, Dilutus	38
Spanish	0·794	Alcohol Anhidro	100
,,	0·8161	,, de 95°	95
,,		,, de 60°	60
Swedish	0·831—0·833	Spiritus Concentratus	90 to 91
,,	0·903—0·905	,, Dilutus	63 to 64
,,	0·935	,, Tenuis	48 to 50
Swiss	0·830—0·834	,,	90·09 to 91·29
,,	0·892—0·895	,, Dilutus	68·12 to 69·34
,,	0·916—0·939	,, e Saccharo (Rum)	50 to 60
,,	0·927—0·950	,, e Vino (Cognac)	45 to 55
U.S.	0·816	Alcohol	94·9
,,	0·797	,, Absolutum	(by weight) 99
,,	0·936	,, Dilutum	48·9
,,	0·925—0·941	Sp. Vini Gallici	46 to 55
,,	0·924—0·945	,, Frumenti	44 to 55

Relative Strength of Wines and Spirits.—The following figures represent the average strength in Alcohol by Volume: Jamaica Rum, about 69 p.c.; Proof Spirit, about 57 p.c.; Whisky, about 51 p.c.; Brandy, about 48 p.c.; Gin, about 47 p.c.; Port, Sherry and Madeira, about 20 p.c.; Burgundy, Claret, Hock and Moselle, about 10 p.c.; strong Ale and Stout, 7 to 8 p.c.; Beer and Cyder, 5 to 6 p.c.

SPIRITUS VINI GALLICI.

BRANDY.

The *B.P.* describes Brandy as a spirituous liquid distilled from Wine and matured by age. It is required to contain not less than 36½ p.c. w/w or 43½ p.c. w/v of Ethyl Hydroxide. The *U.S.P.* describes it as an alcoholic liquid obtained by the distillation of the fermented unmodified juice of fresh grapes, requires it to be at least 4 years old, and that it shall contain approximately 39 to 47 p.c. w/w or 46 to

55 w/v of Absolute Alcohol. The *P.G.* does not include Brandy. A good deal of attention has been devoted to the subject of Brandy, and numerous prosecutions have arisen from the sale of a mixture of Brandy and a spirit not derived from the distillation of the grape as genuine Brandy. At a discussion opened before the Society of Public Analysts by Mr. Otto Hehner and reported in the *Analyst* xxx. 36, it seemed to be generally agreed that a definite standard of 80 per 100,000, that is to say, 80 grammes of Ethyl Acetate per 100,000 of Absolute Alcohol, could not be relied upon for the compound Ethers. Schidrowitz and Kaye have found (*Analyst*, xxx. 149) that the 'break down' of Brandy if effected with faintly alkaline Water is liable to seriously affect the Ether value, a sample possessing an Ester value of 98·8, that is to say, containing 98·8 grammes of Ethers expressed as Ethyl Acetate per 100 litres of Absolute Alcohol, when broken down the Ester value was reduced to 66·5. The former author considers (*J.S.C.I.*, '05, 177) that each case should be considered on its merits, and no conclusion should be drawn from a single figure, on the other hand the sample which is analytically satisfactory is not necessarily genuine. In cases of doubt a taster's assistance should be requisitioned, if both the opinion of the analyst and of an unprejudiced taster are adverse to the sample, the merchant or distiller should be called on to give evidence as to the origin, etc.

In the present state of our knowledge it is impossible to tell from an analytical point of view the origin of the spirit in Brandy.

Tests.—The *B.P.* does not include any test for Brandy, nor does it even indicate a method by which the official percentage of Ethyl Hydroxide may be ensured. The sp. gr. of Brandy is about 0·930. The *U.S.P.* requires that the sp. gr. of Brandy should be not more than 0·941 nor less than 0·925 at 15·6° C. (60° F.). Genuine typical Brandies contain from 39 to 47 p.c. by weight of Absolute Alcohol, and these limits have been adopted as a standard of strength by the *U.S.P.* The average strength of Absolute Alcohol is about 42 p.c. w/w. The percentage of Absolute Alcohol may be determined by a similar method to that described under Spiritus Frumenti. The extractive matter varies from 0·6 to 1·5 p.c. and averages about 0·75 p.c. w/v. The *U.S.P.* requires that the percentage w/v of residue dried at 100° C. (212° F.) should not amount to more than 0·5, and that this residue should have no sweet or distinctly spicy taste, indicating the absence of added Sugar, Glycerin and aromatic substances, and may be determined by evaporating a measured quantity of 25 c.c. to dryness on a water-bath, the residue being dried at a temperature of 100° C. (212° F.) until constant in weight, and when cool, weighed. The proportion of volatile acid varies from 0·032 p.c. w/v to 0·1 p.c. w/v, averaging about 0·042 p.c. w/v. It may be determined on the distilled spirit by a similar method to that described under Spiritus Frumenti, and may be expressed in terms of Acetic Acid. The compound Ethers expressed in terms of Ethyl Acetate vary from 0·051 to 0·086 p.c. w/v, and average about 0·055 p.c. w/v, equivalent to 130·9 per 100,000, calculated on a spirit of an average Alcohol content of 42 p.c.

Their amount may be determined by the Saponification test given under Spiritus Frumenti. The *U.S.P.* includes a limit of free acid which represents the total acidity of the Brandy, volatile acid as well as fixed, and mentions that 100 c.c. of the Brandy should require not more than 1 c.c. of Normal Volumetric Potassium Hydroxide Solution to render it distinctly alkaline to Litmus. The higher Alcohols expressed in terms of Amyl Alcohol vary from 0·05 p.c. w/v to 0·136 p.c. w/v, averaging about 0·068 p.c. w/v, their amount may be determined by the Allen-Marquardt process given under Spiritus Frumenti, and the same tests as are there described for the detection of Aldehyde and Furfural may also be employed here.

The Circular No. 18 issued by the United States Department of Agriculture defines potable Brandy as a distillate from Wine properly aged by storage in wood, to eliminate the amount of Fusel Oils, etc., which may be present. It is required to contain not less than 45 nor more than 55 p.c. w/v of Absolute Alcohol, and not more than 0·25 p.c. w/v of extractive matter. The contents of Fusel Oil should not exceed 0·25 p.c. w/v. Brandy should not be mixed with Alcohol from any other source than that of distilled Wine, the distillate from the lees, pomace, and refuse of the winery is not entitled to bear the term 'Brandy' in the potable sense. Cognac is only admitted as a name, in the case of Brandies made in Cognac from wines grown and manufactured there; no artificial colour other than that derived from the wood in which they are aged is admitted in Brandies. The *U.S.P.* requires that when 100 c.c. of Brandy are slowly evaporated in a tared dish on a water-bath the last portions volatilised should have an agreeable odour free from harshness, indicating the absence of Fusel Oil from grain or pot spirit, the residue should completely dissolve in 10 c.c. of cold Water, and the solution so produced should not be coloured deeper than light green on the addition of a few drops of Ferric Chloride T.S., indicating the absence of more than traces of Oak Tannin from casks.

Foreign Pharmacopœias.—Official in Austr. (Spiritus Vini Cognac), U.S. (Spiritus Vini Gallici).

Preparation.

MISTURA SPIRITUS VINI GALLICI. Mixture of Brandy.

Rub the yolks of two Eggs with $\frac{1}{2}$ oz. of Refined Sugar; add 4 fl. oz. of Cinnamon Water and 4 fl. oz. Brandy.

Dose.—*As a draught*, 1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Not Official.

STANNI OLEAS.

A greyish, coarsely granular powder, insoluble in Alcohol, very slightly soluble in Almond Oil, completely disintegrated and partially dissolved by Ether or Oleic Acid.

UNGUENTUM STANNI OLEATIS.—Stannous Oleate, 60 grains; Lard, 1 oz.

Of great utility in diseases of the nails; it overcomes the brittle, split and soft conditions of the nails, and gives them a brilliant lustre.—*B.M.J.* '84, ii, 753; *T.G.* '86, 494.

STAPHISAGRIÆ SEMINA.

STAVESACRE SEEDS.

FR., STAPHYSAIGRE; GER., STEPHANSKÖRNER; ITAL., STAFISAGRIA;
SPAN., ESTAFISAGRIA.

The dried ripe Seeds of *Delphinium Staphisagria.*

Medicinal Properties.—The Seeds have been used in ointments for many years as a parasiticide for pediculi; the activity rests in an Oil which they contain in rather large quantity. The late Balmanno Squire experimented with this Oil, and also with the Seeds from which the Oil had been withdrawn by Ether, and found the latter inert. He successfully used an ointment made with the Oil in prurigo senilis.

Official Preparation.—Unguentum Staphisagriæ.

Not Official.—Lotio Staphisagriæ, Oleum Staphisagriæ, Unguentum Olei Staphisagriæ, and Delphinina.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr., Ital., Port., Mex. and U.S.

Descriptive Notes.—The Seeds are greyish-black, or blackish-brown if not quite ripe, about three lines long, and rather less in width, irregularly 4 to 5-sided with one side convex and the others more or less flattened or concave, the angles are sharp, and the testa is rough, wrinkled and deeply pitted. The albumen is whitish, oily, and has a minute embryo at the pointed end. No other *Delphinium* in cultivation has so large a seed; the species usually grown in botanic gardens as this plant has smaller seeds and lilac flowers and is *D. pictum*, Willd. *D. Staphisagria*, L., has blue flowers and is only half hardy.

Tests.—Stavesacre Seeds yield from 10 to 15 p.c. of ash. The Seeds contain a large proportion of fixed Oil. Four samples of Seeds examined in the author's laboratory when extracted with Ether yielded 31·4, 32·8, 33·9 and 34·8 p.c. of Oil.

Preparation.

UNGUENTUM STAPHISAGRIÆ. STAVESACRE OINTMENT.
Digest 2 of crushed Stavesacre Seeds in 8½ of Benzoated Lard on a water-bath for 2 hours, squeeze through calico, and dissolve 1 of Yellow Beeswax in the hot liquid, and finally stir until cold.

About half the strength of *B.P.* '85, and Yellow Beeswax is added.

Official in Ital., 1 and 3.

Not Official.

LOTIO STAPHISAGRIÆ. *Syn.* Nursery Hair Lotion.—Stavesacre Seeds, in rough powder, 2 oz.; Acetic Acid, 1 oz.; Water, 16. Boil for 10 minutes in a covered vessel, set aside till cold; then add Rectified Spirit, 2 oz.; Oil of Geranium, 2 minims; Oil of Lavender, 2 minims; Oil of Lemon, 4 minims; filter and add Glycerin, 1 oz.; Water, to 20 fl. oz. This is the Edinburgh Infirmary Pharmacopœia preparation.—*Pharm. Form.*

This has been incorporated in the *B.P.C.*

OLEUM STAPHISAGRIÆ.—The Oil obtained by expression from the Seeds.

It is insoluble in Alcohol (90 p.c.), but dissolves readily in hot Absolute Alcohol.

Tests.—Stavesacre Oil has a sp. gr. of about 0·918.

UNGUENTUM OLEI STAPHISAGRIÆ.—Expressed Oil, 60 minims; Lard, 1 oz. Used as a non-irritant remedy in scabies and in phtheiriasis.

DELPHININA. Delphinine.—Rhombic crystals or as a yellowish powder. An alkaloid obtained from Stavesacre. Insoluble in Water, but dissolves in acidulated Water, in Alcohol, Ether and Chloroform. It melts at about 192° C. (377·6° F.). It yields no colour reactions with acids, but when mixed with 1 to 2 volumes of Amyl Alcohol and treated with Sulphuric Acid, it yields an orange-coloured mass, which after several hours becomes dark rose-red and ultimately blue.

Dose.—$\frac{1}{60}$ grain = 0·0011 gramme; and repeat every 2 hours in neuralgia. —*L.M.R.* '87, 446; *L.* '87, ii. 879.

Not Official.

STEARIN.

COCOA-NUT STEARIN.

A white, soft, crystalline, fatty substance, unctuous to the touch, and possessing a strong, characteristic odour of Cocoa-nut.

This substance is more suitable for the manufacture of **suppositories** (especially in the cooler months of the year) than Oil of Theobroma; the m.p. of the latter is so near the temperature of the body that the suppositories made with it frequently take a very long time to melt. Mixtures of Stearin and Theobroma Oil give intermediate figures.

Tests.—Cocoa-nut Stearin has a sp. gr. at 60° C. (140° F.) of about 0·896. It has a m.p. of 28·9° C. (84° F.). It possesses a Saponification value of about 256, and an Iodine absorption of about 5. When distilled by the Reichart-Vollney test the number of c.c. of Tenth-normal Volumetric Barium Hydroxide Solution required to neutralise the distillate should amount to about 3 c.c.

Not Official.

STILLINGIA.

QUEEN'S ROOT.

The Root of *Stillingia sylvatica*, L., is official in U.S. It is stated to contain an alkaloid 'Stillingine' which should not be confounded with the eclectic remedy 'Stillingin.' Has been found useful in secondary syphilis, tuberculosis and cutaneous diseases.

Fluid Extract (1 in 1), average dose 2 c.c. (30 minims), is official in U.S., and forms a convenient means of exhibition.

STRAMONII FOLIA.

STRAMONIUM LEAVES.

FR., STRAMOINE; GER., STECHAPFELBLATTER; ITAL., STRAMONIO; SPAN., ESTRAMONIO.

The dried Leaves of *Datura Stramonium*, L.

☞ They contain an alkaloid, Daturine, identical with Hyoscyamine.

The Stramonium Leaves official in the *U.S.P.* are required to yield not less than 0·25 p.c. of mydriatic alkaloids.

Medicinal Properties.—It is much used for spasmodic asthma in the form of **cigarettes** and **smoking mixtures.**

Dose.—*Ph. Ger.* maximum single dose, 0·2 gramme; maximum daily dose, 0·6 gramme.

Under the title **Daturæ Folia**, the dried leaves of *Datura fastuosa*, L., var. *alba*, Nees., are official in the *Ind.* and *Col. Add.*, for India, the Eastern and West Indian Colonies.

Official Preparation.—Tinctura Stramonii.

Not Official.—Extractum Stramonii, Fluidextractum Stramonii, Pulvis Stramonii Compositus, Folia Stramonii Nitrata, and Unguentum Stramonii.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—The Stramonium Leaves of commerce have, during the last few years, been frequently adulterated. The genuine leaves average about 3 to 6 in. (7 to 15 cm.) long, and 2 to 3 in. (5 to 8 cm.) broad, but are sometimes much larger, 9 by 6 in. (22 by 15 cm.), have an ovate outline, a petiole 1 in. (25 mm.) or more long, a sinuate margin with acute, rather distant triangular teeth of variable size, an unequal base, a minutely wrinkled surface when dried, a paler under surface, and a characteristic odour. The leaf has a bitterish, saline taste.

Under the microscope the powder is easily distinguished from that of Belladonna Leaves by the presence of cluster crystals and the absence of crystal-sand cells, by the epidermal cells not being striated, by the long hairs having rough or papillose walls and no terminal glands, and by the long palisade cells 5 or 6 times longer than broad, *Vogl. Atlas.* None of the adulterants hitherto used possess these characters.

The leaves of *Datura Tatula*, L., have usually a purplish tinge on the petiole often extending to the mid-rib.

The leaves of *D. fastuosa*, L., var. *alba*, Nees., are official in the *Ind.* and *Col. Add.* The leaves are not acuminate, and are obtusely sinuate, but not dentate.

Tests.—Stramonium Leaves yield from 10 to 15 p.c. of ash. It has been recommended that an ash limit of 15 p.c. and the microscopical characters should be given. The *U.S.P.* gives a method for the assay of the leaves which is identical with that for Belladonna Leaves given under Belladonnæ Folia. A weighed quantity of 10 grammes of Stramonium in No. 60 powder is employed for the determination.

Preparation.

TINCTURA STRAMONII. TINCTURE OF STRAMONIUM.

1 of Stramonium Leaves, percolated with Alcohol (45 p.c.) to yield 5.

B.P. '85 tincture was from the **seeds**, with Proof Spirit.

Tincture of Stramonium *U.S.P.* is required to contain 0·025 p.c. w/v of mydriatic alkaloids from Stramonium. The *B.P.* Tincture is not standardised, the *P.G.* does not include a tincture.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Official in Swiss, 1 of seeds in 10; *U.S.*, 1 of leaves in 10.

Tests.—Tincture of Stramonium has a sp. gr. of 0·950 to 0·964; it contains between 3 and 4 p.c. w/v of total solids and about 43 p.c. w/v of Absolute Alcohol. The *U.S.P.* assays the tincture by a similar process to that given for the assay of Fluid Extract of Belladonna Root given under Extractum Belladonnæ Fluidum. 100 c.c. of the tincture are evaporated to about one-tenth its volume, sufficient Alcohol (94·9 p.c.) is added, if necessary, to dissolve any separated substance, and the assay then continued as directed. The final multiplication by 10 being omitted in the calculation, as 100 c.c. of the tincture and not 10 c.c. of the fluid extract are used for the operation.

Not Official.

EXTRACTUM STRAMONII (*U.S.P.*).—The *U.S.P.* Extract is prepared by the evaporation, to a pilular consistence, of fluid extract of Stramonium at a temperature not exceeding 50° C. (122° F.). The extract is required to contain 1·0 p.c. of mydriatic alkaloids, and in the event of a greater alkaloidal content than the above being yielded when assayed, sufficient powdered Milk Sugar is added to reduce it to the standard.

Tests.—The *U.S.P.* employs a method identical with that for the assay of Extract of Belladonna Leaves given under the heading of Extractum Belladonnæ Viride. A weighed quantity of 5 grammes of the extract is employed for the determination.

FLUIDEXTRACTUM STRAMONII (*U.S.P.*).—An approximately 1 in 1 fluid extract prepared by exhausting Stramonium Leaves in No. 40 powder with a mixture composed of 2 volumes of Alcohol (94·9 p.c.) and 1 volume of Water, reserving the first percolate, evaporating the remainder at a temperature not exceeding 50° C. (122° F.) to a soft extract and dissolving this in the reserved percolate, finally adjusting the fluid extract to contain 0·25 p.c. of mydriatic alkaloids.

Tests.—The Fluid Extract of Stramonium is assayed by the *U.S.P.* by a process identical with that employed for the *U.S.P.* assay of Fluid Extract of Belladonna Root given under Extractum Belladonnæ Fluidum. A measured quantity of 10 c.c. of the Fluid Extract is employed for the determination.

PULVIS STRAMONII COMPOSITUS.—Stramonium Leaves, Datura Tatula, Cannabis Indica, and Lobelia Inflata, all in powder, of each 6 drm.; Nitre, in powder, 1 oz.; Eucalyptus Oil, 30 minims; mix thoroughly.

It burns well, gives off dense fumes, and affords great relief during asthmatic attacks.—*B.M.J.* '84, ii. 465; '87, ii. 494.

Several formulas, somewhat similar to the above, appear in the Hospital Pharmacopœias. **Himrod's cure** and several other similar preparations have also been recommended for asthma.

Folia Stramonii Nitrata.—Coarsely powdered Stramonium Leaves, 2; Potassium Nitrate, 1; Water, 3; soak, and after 12 hours, dry.

UNGUENTUM STRAMONII.—Extract of Stramonium, 10; Diluted Alcohol, 5; Hydrous Wool Fat, 20; Benzoinated Lard, 65.—*U.S.P.*

This has been incorporated in the *B.P.C.*

STRAMONII SEMINA.

STRAMONIUM SEEDS.

The dried ripe, black, reniform Seeds of *Datura Stramonium*, L.

The mixed alkaloids of Stramonium are generally called **Daturine**, but are the same as contained in Belladonna, viz., a mixture of Hyoscyamine and Atropine.

The dried pale brown, obovate, compressed Seeds of *Datura fastuosa*, L., var. *alba*, Nees., are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies; also **Tinctura Daturæ Seminum** (1 in 4), dose 5 to 15 minims = 0·3 to 0·9 c.c.

Medicinal Properties.—Similar to those of Belladonna. Antispasmodic and sedative in spasmodic and bronchitic asthma. The Extract and the Tincture are used in convulsive cough as antispasmodics. The Extract has been given with success in hay asthma. Like Belladonna, it causes dilatation of the pupil.

Official Preparation.—Extractum Stramonii.

Not Official.—Guttæ Daturinæ.

Antidotes.—Same as for poisoning with Belladonna, p. 224; also Morphine subcutaneously, and Chloroform Inhalation.

Foreign Pharmacopœias.—Official in Port. (Estramonio), and Swiss.

Tests.—Stramonium Seeds yield from 2 to 3 p.c. of ash. The total alkaloids vary from 0·17 to 0·5 p.c., an average of 15 samples gave 0·35 p.c.; in the Leaves the percentage of alkaloid varied from 0·32 to 0·47 p.c., an average of 11 samples being 0·38 p.c. The *U.S.P.* requires that the dried leaves contain not less than 0·25 p.c. of mydriatic alkaloids.

Preparation.

EXTRACTUM STRAMONII. EXTRACT OF STRAMONIUM.

A firm Extract, prepared by exhausting Stramonium Seeds, in No. 40 powder, with Alcohol (70 p.c.), and evaporation of the percolate.

B.P. '85 used Proof Spirit and removed the fixed Oil by Ether.

Dose.—¼ to 1 grain = 0·016 to 0·06 gramme.

Not Official.

GUTTÆ DATURINÆ.—Daturine Sulphate, 2 grains; Water, 1 fl. oz.—*London Ophthalmic.*

Not Official.

STRONTII BROMIDUM.

STRONTIUM BROMIDE.

$SrBr_2 6H_2O$, eq. 352·92.

FR., BROMURE DE STRONTIUM; GER., STRONTIUMBROMID; ITAL., BROMURO DI STRONZIO; SPAN., BROMURO ESTRONCICO.

Colourless, translucent, hexagonal, deliquescent prisms, having a bitter saline taste.

It should be kept in well-stoppered glass bottles of a dark amber-tint in a cool place and protected as far as possible from exposure to the air, as it has a tendency to deliquesce. *U.S.P.* states that it is also occasionally efflorescent.

Strontii Bromidum Exsiccatum is also commercial. 69 of the anhydrous is equivalent to 100 of the crystallised salt.

Solubility.—2 in 1 of Water; 1 in 3 of Alcohol (90 p.c.).

Medicinal Properties.—Recommended in chronic gastritis and dilated stomach, in doses of 30 grains thrice daily, also in similar doses in epilepsy; is said by some to be less depressant than Potassium Bromide.—*B.M.J.* '92, ii. 1286; '95, i. 1089, 1252; *B.M.J.E*, '95, i. 76; *L.* '92, i. 47; '93, ii. 46; '95, i. 567; '96, ii. 871; '98, ii. 988. Many cases of epilepsy in which, if it gets a fair trial, it will have pre-eminence over other Bromide salts.—*L.* '07. i. 20. In acute gastric catarrh, *Pr.* liii. 130; in vomiting, *T.G.* '93, 115; in enteritis, *M.A.* '95, 239; in exophthalmic goître in children.—*B.M.J.* '98, ii. 1042. Increases coagulability of blood.—*L.* '08, i. 97.

15 grains 3 times daily, increasing the amount if necessary to 20 grains and then to 30 grains and 40 grains 3 times daily until seizures are under control. Whilst in some cases apparently of greater value than Potassium Bromide in controlling epileptic seizures, yet on account of the more rapid action of the latter, its more lasting effect, the smaller dose required, and lastly, its cheapness, the Potassium salt must be regarded as the more generally useful in the treatment of epilepsy.—*L.* '99, ii. 411.

It has an unpleasant, metallic taste.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

3 drm. daily has been given for weeks without any unpleasant symptoms.—*L.* '98, ii. 988.

Foreign Pharmacopœias.—Official in Fr., Mex., Span. and U.S.

Tests.—Strontium Bromide melts when heated, and finally loses all its Water of crystallisation, equivalent to 30·4 p.c. The *U.S.P.* states that the anhydrous salt fuses at 630° C. (1166° F.). A crystal of the salt moistened with Hydrochloric Acid and introduced in a loop of platinum wire into a non-luminous flame gives a brilliant crimson coloration. The salt dissolves readily in Alcohol, but is precipitated from its alcoholic solution by the addition of Ether. It dissolves readily in Water, forming a clear solution, which should be neutral in reaction towards Litmus. A 5 p.c. aqueous solution affords on the addition of a saturated solution of Calcium Sulphate a white precipitate insoluble in diluted acids. Potassium Chromate Solution affords a yellow precipitate soluble in Acetic Acid; Ammonium Carbonate Solution yields a white precipitate soluble with effervescence in Acetic Acid. The aqueous solution affords with Silver Nitrate Solution a yellowish curdy precipitate practically insoluble in Ammonia Solution. The percentage of pure Strontium Bromide present in a specimen may be determined by titrating a weighed quantity of the salt with Tenth-normal Volumetric Silver Nitrate Solution, using Potassium Chromate Solution as an indicator of neutrality. The *U.S.P.* requires that a weighed quantity of 0·5 of a gramme when dissolved in about 50 c.c. of Water shall require not less than 27·4 (27·48) c.c. nor more than 29·4 c.c. of the volumetric solution to produce a permanent red colour, corresponding to at least 97 p.c. of pure Strontium Bromide.

The more generally occurring impurities are excess of Water, Copper, Lead, Iron and Zinc, Barium, Chlorides and Iodides. The aqueous solution either when faintly acidified with diluted Hydrochloric Acid, or when rendered faintly alkaline with Ammonia Solution, should not be darkened in colour by Hydrogen Sulphide, indicating the absence of Copper, Lead and Zinc. A weighed quantity of 1 gramme of the salt when mixed with an equal weight of Sodium Acetate, and the mixture dissolved in 5 c.c. of Distilled Water when rendered faintly acid with 3 to 5 drops of diluted Acetic Acid and mixed with 5 drops of Potassium Bichromate Solution should not afford a cloudiness within 3 minutes, indicating the limit of Barium. If the precipitate obtained by completely precipitating an aqueous solution of the salt with Silver Nitrate Solution be separated, shaken with Ammonia Solution and filtered, upon adding Nitric Acid in slight excess to the filtrate, no pronounced turbidity should result, indicating the absence of more than traces of Chlorides. If a little Chlorine Water diluted with an equal volume of Water be added carefully drop by drop to 10 c.c. of an aqueous

5 p.c. solution of the salt and the aqueous mixture be shaken with a little Carbon Bisulphide, the Carbon Bisulphide solution should assume a yellow or yellowish-brown colour, and should be free from any violet tint, indicating the absence of Iodides.

STRONTII CINNAMAS.—A white, or whitish, amorphous powder, soluble 1 in 100 of Water; insoluble in Alcohol (90 p.c.). It has been used suspended in 3 parts of Glycerin to 5 parts of Water in malignant disease.—*L.* '03, ii. 750.

Tests.—Strontium Cinnamate when strongly heated evolves an aromatic odour resembling Benzaldehyde, and finally burns leaving a carbonaceous residue which when dissolved in Water possesses a strongly alkaline reaction towards red Litmus paper, and effervesces on the addition of diluted Hydrochloric Acid, the solution when neutralised answering the tests distinctive of Strontium given under the heading of Strontii Bromidum. The Cinnamic Acid separated from the salt should possess the m.p. and answer the tests distinctive of Cinnamic Acid given under the heading of Acidum Cinnamicum.

STRONTII IODIDUM ($SrI_2 6H_2O$, eq. 446·02).—Translucent, colourless, hexagonal prisms or a white granular powder, readily soluble in Water, possessing a bitter saline taste. It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from contact with air, as it is of a deliquescent nature and liable to change to a yellow colour on exposure to the light. It has been used in place of the alkali Iodides in chronic endocarditis.

Dose.—7½ to 15 grains = 0·5 to 1 gramme.

Foreign Pharmacopœias.—Official in U.S.

Tests.—The salt melts when cautiously heated, gradually losing the whole of its Water of crystallisation, equivalent to 24·05 p.c., and leaving a residue of the anhydrous salt. It dissolves in Water, forming a clear solution which is neutral to Litmus, or but very faintly alkaline to red Litmus paper. It yields the tests distinctive of Strontium given under the heading of Strontium Bromide. The aqueous solution affords with Silver Nitrate Solution a yellow curdy precipitate insoluble in Nitric Acid, insoluble in Ammonia Solution, but soluble in Potassium Cyanide Solution. The aqueous solution when cautiously mixed with diluted Chlorine Water affords a yellowish coloration changing to blue on the addition of Mucilage of Starch. If the liquid before the addition of Starch solution be shaken with Carbon Bisulphide, the Carbon Bisulphide Solution assumes a strong violet colour. The percentage of pure Iodide present in a specimen may be determined by titrating a weighed quantity with Tenth-normal Volumetric Silver Nitrate Solution, using Potassium Chromate Solution as an indicator. The *U.S.P.* employs an excess of Tenth-normal Volumetric Silver Nitrate Solution, titrating the excess with Tenth-normal Volumetric Potassium Sulphocyanate Solution, using Ferric Ammonium Sulphate T.S. as an indicator. A weighed quantity of 0·5 of a gramme of the Iodide is dissolved in about 100 c.c. of Distilled Water, 25 c.c. of Tenth-normal Volumetric Silver Nitrate Solution added, 5 c.c. of Nitric Acid and 5 c.c. of Ferric Ammonium Sulphate Solution, the flask stoppered and shaken; not less than 1·7 c.c. nor more than 3·1 c.c. of Tenth-normal Volumetric Potassium Sulphocyanate Solution should be required to produce a permanent red tint, corresponding to 98 p.c. of pure Strontium Iodide.

The more generally occurring impurities are Copper, Lead, Iron and Zinc, Barium and Chlorides. Neither the aqueous solution slightly acidified with diluted Hydrochloric Acid nor an aqueous solution made faintly alkaline with Ammonia should afford any darkening in colour on the addition of Hydrogen Sulphide, indicating the absence of Copper, Lead, Iron and Zinc. The presence of Barium may be detected by a test similar to that described under Strontium Bromide. If the precipitate obtained by completely precipitating an aqueous solution of the salt with Silver Nitrate, be separated, shaken with Ammonia and filtered, the filtrate rendered faintly acid with Nitric Acid should not yield any pronounced turbidity, indicating the absence of more than traces of Chlorides.

STRONTII LACTAS ($Sr(C_3H_5O_3)_2\ 3H_2O$, eq. 317·32).—A white granular powder, or in crystalline nodules, soluble 1 in 3 of Water. Has been recommended for albuminuria in parenchymatous nephritis.—*L.* '92, i. 47; '95, i. 567; '96, i. 255; *T.G.* '94, 461; *B.M.J.E.* '96, ii. 76; '97, ii. 40. Excellent diuretic in Bright's disease.—*L.* '94, ii. 992.

Dose.—20 to 30 grains = 1·3 to 2 grammes.

Official in Fr. and Mex.

Tests.—Strontium Lactate when heated to 110° C. (230° F.) loses its Water of crystallisation, equivalent to 16·9 p.c. At a still higher temperature it yields inflammable vapours, and burns leaving a carbonaceous residue which effervesces strongly on the addition of Hydrochloric Acid and which produces a distinctive crimson flame test of Strontium. The salt dissolves in Water, yielding a clear solution which is slightly acid in reaction towards blue Litmus paper. It answers the tests distinctive of Strontium given under the heading of Strontii Bromidum. The aqueous solution when acidified with Sulphuric Acid and treated with Tenth-normal Volumetric Potassium Permanganate Solution decolorises the Permanganate, evolving simultaneously an odour of Aldehyde. The percentage of pure Strontium Lactate may be determined by extracting the carbonaceous residue left on igniting the carefully dried salt, with boiling Water, until the washings no longer effect Methyl Orange Solution; the filtrate and washings being titrated with Normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as an indicator of neutrality. A weighed quantity of 1·33 gramme of the salt thus treated should require for complete neutralisation not less than 9·9 c.c. of the Normal Volumetric Acid Solution, corresponding to at least 98·6 p.c. of the pure salt.

The more generally occurring impurities are Arsenic, Copper, Lead, Iron and Zinc, Barium, Carbonates and Oxalates, Chloride, Butyrate, Propionate, and readily charred organic impurities. Arsenic, Copper, Lead, Iron and Zinc may be tested for as described under Strontium Bromide or Strontium Iodide, as also may Barium. The 5 p.c. aqueous solution of the salt should be perfectly clear leaving no weighable residue, and no effervescence should occur on mixing 0·5 of a gramme of the salt with 1 c.c. of Sulphuric Acid, indicating the absence of Carbonates and Oxalates. The aqueous solution of the salt should not afford more than a slight opalescence on the addition of Silver Nitrate Solution, indicating the absence of more than traces of Chloride. A solution of the salt in concentrated Sulphuric Acid should be free from perceptible or penetrating odour, even after gently heating, indicating the absence of Butyrate and Propionate, and this Sulphuric Acid Solution should not become in 10 minutes more than a pale straw yellow colour, indicating the absence of readily charred organic impurities. The salt should not lose, when carefully dried at the temperature mentioned above, more than its proper quantity of Water of crystallisation.

STRONTII SALICYLAS ($Sr(C_7H_5O_3)_2\ 2H_2O$, eq. 394·72).—A white powder, slightly soluble in Water.

It should be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere and protected as far as possible from the light.

Has been recommended as an intestinal antiseptic; also in gouty and rheumatic conditions.—*C.D.* '95, i. 291; *P.J.* '96, ii. 63; '97, ii. 118.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Official in U.S.

Tests.—Strontium Salicylate decomposes on heating, giving off inflammable vapours and an odour of Phenol, and leaving a residue of Strontium Carbonate. This residue dissolves with effervescence in Hydrochloric Acid, giving a solution which affords the distinctive flame test for Strontium. The salt dissolves in Water, forming a clear solution which is faintly alkaline in reaction towards red Litmus paper. This aqueous solution answers the tests distinctive of Strontium given under Strontii Bromidum. A 1 p.c. aqueous solution of the salt affords with Ferric Chloride T.S. a deep violet coloration. A 5 p.c. aqueous solution affords with Copper Sulphate T.S. a green coloration. A small quantity of the salt when warmed with a few drops of concentrated Sulphuric Acid and a little Methyl Alcohol evolves the distinctive odour of Methyl Salicylate.

The *U.S.P.* method of determination is a gravimetric one, 0·5 of a gramme of the salt is moistened with 1 c.c. of Sulphuric Acid, the mixture cautiously heated until no more vapours are given off, the residue again moistened with a few drops of the acid, again heated and finally ignited until of a constant weight. The *U.S.P.* requires that the residue of Strontium Salicylate should weigh not less than 0·227 gramme corresponding to not less than 98·5 p.c. of pure Strontium Salicylate. The Salicylic Acid separated by acidification from the aqueous solution, washing the precipitate till free from mineral acid and carefully drying, should possess the m.p. and answer the tests distinctive of Salicylic Acid given under Acidum Salicylicum.

The more generally occurring impurities are Copper, Lead, Iron and Zinc, Barium, Carbonates and Chlorides. The same methods may be employed for the detection of Copper, Lead, Iron, Zinc and Barium as are employed in the examination of Strontium Bromide and Strontium Iodide. The concentrated aqueous solution should afford a white crystalline precipitate but yield no effervescence on the addition of diluted Nitric Acid, indicating the absence of Carbonate, and if the crystalline precipitate be filtered off, the filtrate should not afford a distinct turbidity on the addition of Silver Nitrate Solution, indicating the absence of more than traces of Chlorides. The absence of excess of Water of crystallisation may be ensured by a determination of the loss of weight on heating the salt at 100° C. (212° F.).

STROPHANTHI SEMINA.

STROPHANTHUS SEEDS.

Fr., Strophanthus; Ger., Strophanthussamen; Ital., Strofanto;
Span., Estrofanto.

The dried ripe Seeds of *Strophanthus Kombé*, freed from the awns.

The commercial seed usually contains the seeds of other species in addition to those of *S. Kombé*.—*P.J.* (3) xix. 660. The active principle is a glucoside, **Strophanthin.**

Medicinal Properties.—A cardiac tonic. Especially valuable in mitral regurgitation with failure of compensation, and in aortic regurgitation accompanied by cardiac insufficiency. The active principle being very soluble and diffusible, Strophanthus acts with such rapidity that it is more useful than Digitalis in promptly stimulating extreme or sudden cases of cardiac failure. Of great value in avoiding both the cardiac embarrassment so frequently fatal in acute pneumonia and the collapse which may occur at the crisis. It is easily eliminated, it is not cumulative, it can be administered over a long period of time, and, unless there be marked gastro-intestinal catarrh, it has no tendency to produce digestive disturbance. It has acted beneficially in many cases in which Digitalis has failed or has disagreed.

Strophanthus acts more energetically on the heart than on the vessels, whereas Digitalis acts on the vessels as much as, or even more than, on the heart. Digitalis thus possesses the power of increasing arterial tension, and so of putting extra strain on the heart; therefore, in those cases in which pulse tension is high, Strophanthus is to be preferred.

A more powerful cardiac tonic than Digitalis and superior as a diuretic.—*B.M.J.* '95, i. 368; *B.M.J.E.* '97, ii. 3; '98, i. 12; *T.G.* '98, 36.

In Graves' disease.—*L.* '93, ii. 822. In alcoholism.—*L.* '94, ii. 212.

As to the disparity in the results obtained by different observers, Fraser remarks that, 'there are several species of the genus, and that while the therapeutic effects have been determined with only one of these species, the seeds of several of the others have indiscriminately been substituted. The whole fruit, and not the seeds only, and immature seeds, poor in the active principle and rich in irritating resin, have been used to prepare the Tincture; seeds already exhausted with Alcohol have been re-sold in the market; and further, even when good seeds were used, Petroleum Ether has been substituted for Ethylic Ether, preparatory to percolation with Rectified Spirit, with the result that the Tincture (1885) contained much resin, which produced stomach and intestinal disorder.'

Official Preparations.—Extractum Strophanthi and Tinctura Strophanthi.

Not Official.—Strophanthin and Ouabain.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Russ., Span., Swiss and U.S.

Descriptive Notes.—For many years past the Strophanthus seeds of commerce have been almost invariably a mixture derived from different species. The official seeds are limited to those of *Strophanthus Kombé*, Oliver. They are about $\frac{5}{8}$ in. (15 mm.) long and rather more than $\frac{1}{8}$ in. (4 mm.) broad (15 mm. long, 4 to 5 mm. wide and 2 to 2·5 mm. in thickness, *U.S.P.*; 17 mm. long, 5 mm. broad, 3 mm. thick, *P.G.*), of a greenish-fawn colour and covered with silky adpressed hairs, linear, elliptical, acuminate, compressed, rounded at the base and having a longitudinal ridge on one side from $\frac{1}{8}$ in. below the centre to the apex of the seed, the cotyledons are straight, surrounded with a thin endosperm; the odour is characteristic, the taste very bitter.

The seeds vary a little in size and shape according to their position in the pod, the lowest being usually rather longer, more acuminate, and furnished with longer awns.

The pods and seeds of *Strophanthus Courmontii*, Sacl., var. *fallax*, Holmes, so closely resemble in size, shape and colour those of *S. Kombé* that it is practically impossible to distinguish them by sight, although the flowers and leaves of the two species are quite distinct. There are microscopical differences between the two seeds, but it needs an expert to detect them.

The colour of the seeds appears brownish or greenish-grey, according to the incidence of the light and the position of the observer with regard to it, due to the disposition of the hairs. But when a section of the seed is immersed in a mixture of 8 parts concentrated Sulphuric Acid (*B.P.*) strength and 2 of Water, a deep green colour rapidly appears in the albumen surrounding the embryo to which the colour gradually extends. The seeds of no other known species except those of *S. hispidus*, DC. give this reaction, and the seeds of that species are smaller and dark brown in colour. They also contain the same active principle, but just as there are seeds closely resembling those of *S. Kombé*, which slowly give a pink reaction, so there is a seed closely resembling *S. hispidus*, viz., *S. Arnoldianus*, De Wild. and Dur., in its brown colour and size, which gives a pink reaction, so that in either case a colour test is necessary. Several of the species are not regarded by the African natives as poisonous, but the woolly Zambesi seeds, *S. Nicholsoni*, Holmes, that have appeared in commerce, distinguished by the longer white hairs hiding the apex of the seed, and those of *S. gratus*, Franch., are recognised by the natives as poisonous and are used in making arrow poison. The seeds of the latter are the only W. African kind imported into commerce that are quite hairless. Both of these give a pink coloration with Sulphuric Acid, but it is probable that this reaction, though useful to distinguish other seeds from those of *S. Kombé*, does not always depend upon the presence of Ouabain as it does in the seeds of *S. gratus*. At the present time it is possible to obtain commercially in London the seeds of *S. Kombé* unmixed with other kinds. It should be noted that the acid used for testing is apt to become weaker by keeping, and recently mixed acid should therefore be employed, as a weak acid does not readily give the green reaction. The *P.G.* points out that the starch grains in the official seed do not exceed 0·008 mm., and the *U.S.P.* that the hairs appear under the microscope of a light brownish-green colour, are thin-walled, 1-celled, and 1 mm. or less in length.

Tests.—Strophanthus seeds contain from 3 to 4 p.c. of ash, and 5 p.c. is rarely exceeded. The *B.P.* states that Sulphuric Acid colours the endosperm and sometimes the cotyledons a dark green, indicating the presence of Strophanthin. The *B.P.* employs a concentrated acid. The author found from an examination of commercial tinctures of Strophanthus that the use of a Sulphuric Acid slightly diluted with Water gave a more definite reaction. Holmes has suggested (*P.J.* '02, i. 254) that in a future edition of the *B.P.* the words 'Sulphuric Acid' should be replaced by 'a freshly prepared solution containing 8 parts of Sulphuric Acid and 2 of Distilled Water.' Several processes have been suggested for the chemical assay of Strophanthus, but not one of them is entirely satisfactory. The following process described (*P.J.* '96, ii. 463; '02, ii. 281, 304) is easy of manipulation and yields results which possess a certain value as a criterion of the activity of the preparation. It is based upon the determination of the amount of Strophanthidin produced on the hydrolysis of Strophanthin. A measured quantity of 50 c.c. of the tincture is diluted with 50 c.c. of Water and the Alcohol removed by distillation. The filtered aqueous liquid, after being shaken with Chloroform, is digested for 1 hour on a water-bath with diluted Sulphuric Acid; after cooling, the turbid liquid is agitated with 3 successive small quantities of Chloroform; the chloroformic layer in each case is separated, transferred to a tared flask, the Chloroform removed by evaporation, the residue of Strophanthidin dried below 65·6° C. (150° F.) and when constant weighed. The percentage of Strophanthidin found divided by 0·365 corresponds to the percentage of Strophanthin present. The physiological method of assay is also in vogue, but it is doubtful whether, in the present state of knowledge, the physiological process possesses any advantages over the chemical. Tinctures made from the seeds answering the official requirements, when carefully prepared, have yet to be shown wanting in activity. So-called physiological standardisation of galenicals leaves much to be desired. A method for rapidly and approximately estimating Strophanthin in the extract and tincture by the optical rotation has been suggested (*C.D.* '98, ii. 289).

Preparations.

EXTRACTUM STROPHANTHI. Extract of Strophanthus.

1 of Strophanthus Seeds, exhausted with Purified Ether, and dried, then percolated with Alcohol (90 p.c.) until 10 of percolate is obtained; concentrate this by evaporation to a thick liquid, and add Milk Sugar *q.s.* to yield 2 of Extract, in powder.

Dose.—¼ to 1 grain = 0·016 to 0·06 gramme.

Official in Mex.

TINCTURA STROPHANTHI. Tincture Strophanthus.

Percolate 1 of Strophanthus Seeds, in No. 30 powder, with Alcohol (70 p.c.) until 20 is obtained, and dilute with Alcohol (70 p.c.) to yield 40. (1 in 40)

B.P. 1898 reduced the strength from 1 in 20 to 1 in 40, making the dose uniform with Tincture of Digitalis.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Foreign Pharmacopœias.—Official in Ital., 1 in 20; Norw., 1 and 10; Austr., Belg., Dan., Dutch, Fr., Ger., Jap., Russ., Span., Swed., Swiss and U.S., 1 in 10; Mex., 1 in 5. All by weight except U.S. The *Brussels Conference* agreed to a strength of 10 p.c., prepared by percolation with Alcohol (70 p.c.), the seeds not to be freed from fat.

Tests.—Tincture of Strophanthus has a sp. gr. of 0·890 to 0·894; it contains from 0·4 to 0·9 p.c. w/v of total solids and about 68 p.c. w/v of Absolute Alcohol. 2 c.c. of the tincture evaporated on a water-bath and the residue, when cool, moistened with a drop of a freshly prepared solution containing 8 parts of Sulphuric Acid and 2 of Distilled Water should yield a green and not a red coloration. A standard of 0·2 p.c. has been suggested for the tincture. A method of determining the Strophanthin is described under Strophanthus Semina. Eight samples of tincture obtained from houses of the highest repute examined in the author's laboratory showed percentages of Strophanthin varying from 0·082 to 0·301 p.c., with an average of 0·109 p.c. When tested by the Sulphuric Acid test, as described above, only one sample (that of Fraser's) gave a green coloration, the others yielding either a yellow or purple coloration. Two samples of the *B.P.* tincture prepared in the author's laboratory both gave pure green colorations.

Not Official.

STROPHANTHIN.—A pale yellow amorphous powder, or in white microscopic crystalline plates. It possesses an intensely bitter taste and is extremely poisonous.

Solubility.—Freely in Water and in Alcohol (90 p.c.); practically insoluble in Choroform, Ether, and in Carbon Bisulphide.

Dose.—$\frac{1}{300}$ to $\frac{1}{200}$ grain = 0·0002 to 0·00032 gramme.

It is official in the *U.S.P.* and is described as a glucoside or mixture of glucosides obtained from Strophanthus. It is also official in the *Fr. Codex* and *Mex.*

It should be kept in well-stoppered glass bottles of a dark amber tint and exposed as little as possible to the light.

Tests.—Strophanthin when heated darkens at about 146° C. (294·8° F.), becomes pasty at 165° C. (329° F.), and melts at 172·5° C. (342·5° F.). The *U.S.P.* states that it commences to fuse at 170° C. (338° F.), and is not completely melted until the temperature reaches 190° C. (374° F.). *Fr. Codex* (1908) gives the melting point as 185° C. (365° F.). It dissolves readily in Water, the solution being neutral in reaction to Litmus paper and dextrogyrate. A trace of the substance when moistened with a freshly prepared solution containing 8 parts of Sulphuric Acid and 2 of Distilled Water yields an emerald-green coloration, subsequently changing to brown. An aqueous solution yields on the addition of a trace of Ferric Chloride T.S. and a few c.c. of Sulphuric Acid a reddish-brown precipitate, turning dark green after 1 or 2 hours. Tannic Acid Solution throws down from an aqueous solution a copious white precipitate, which redissolves on agitation until an excess of the reagent has been added. The usual reagents employed as alkaloidal precipitants, *e.g.*, Potassio-mercuric Iodide Solution and Iodo-potassium Iodide Solution, produce no precipitate in solutions of the glucoside. Potassio-cupric Tartrate (Fehling's) Solution produces no red precipitate of Cuprous Oxide when boiled with the aqueous solution, but if an aqueous solution be heated to 70° C. (158° F.) with a small amount of Diluted Sulphuric Acid, the Strophanthin undergoes hydrolysis with the formation of Glucose and Strophanthidin; the latter separating out as a flocculent precipitate which can be filtered off, the filtrate if boiled with Potassio-cupric Tartrate (Fehling's) Solution will now yield a red precipitate of Cuprous Oxide. When ignited with free access of air it should leave no weighable residue.

Ouabain.—White, odourless and tasteless slender transparent needles, practically insoluble in cold Water and Alcohol (90 p.c.), insoluble in Ether and in Chloroform. Recommended medicinally in half the doses of Strophanthin, in cases where Strophanthus and Digitalis both fail. The action is similar to Strophanthin. It is obtained from *Acokanthera Schimperi*, Oliv. (*S. Ouabaio*, Cath.), of the same natural order as Strophanthus, and from the seeds of *S. gratus*.

STRYCHNINA.

STRYCHNINE.

$C_{21}H_{22}N_2O_2$, eq. 331·75.

Translucent, colourless rhombic prisms or a white crystalline powder. Permanent in the air. This alkaloid is odourless, but possesses an intensely bitter taste and is extremely poisonous. It may be obtained from the dried ripe seeds of *Strychnos Nux Vomica*, *Ignatia Amara*, and other species of *Strychnos*.

Strychnine is official in the *B.P.* and *U.S.P.*, but not in the *P.G.*

Solubility.—1 in 6000 to 8000 of Water; 1 in 170 of Alcohol (90 p.c); 1 in 250 of Alcohol (70 p.c.); about 1 in 400 of Alcohol (60 p.c.); 1 in 800 of Alcohol (45 p.c.); 1 in 4200 of Alcohol (20 p.c.); 1 in 350 of Absolute Alcohol; 1 in 6 of Chloroform; nearly insoluble in Ether.

Medicinal Properties.—Similar to those of Nux Vomica; gastric, cardiac, and general tonic; useful in the treatment of reflex or functional paralysis; and of peripheral neuritis and paralysis due to Alcohol, tobacco, or diphtheria; also in cases of lead-palsy. It increases peristalsis, and is therefore a useful addition to other purgatives. Recommended in chronic alcoholism, muscular tremors, tobacco amblyopia, impotence and nervous exhaustion. For other uses and for its contra-indications, *see* Nux Vomica. It has a cumulative action and is a very active poison.

An antidote in Chloroform poisoning.—*B.M.J.E.* '94, i. 47. In snake-bites.—*T.G.* '93, 542; '94, 517.

In the treatment of surgical shock 10 minims of Liquor Strychninæ given subcutaneously just before commencing anæsthesia, followed after the operation by 5 minims subcutaneously injected every 2 hours for several hours if called for.—*L.* '02, i. 1025, 1063, 1210, 1357, 1497; *B.M.J.* '99, ii. 1471.

In diabetes insipidus good results are stated to have followed the injection of $\frac{1}{20}$ grain of the Nitrate on each of the first 2 days, and $\frac{1}{12}$ grain on the third.—*B.M.J.E.* '04, ii. 71; *B.M.J.E.* '06, ii. 72.

Of undoubted value in collapse from cardiac weakness following infantile diarrhœa. Best administered in doses of ½ minim of the Liquor Strychninæ.—*Pr.* lxxv. 508.

In beri-beri $\frac{1}{50}$ grain administered twice daily caused a rapid improvement in a week.—*L.* '05, ii. 540.

In surgical shock, notwithstanding an article which appeared by a distinguished surgeon, in which its administration in large doses hypodermically was advocated, Strychnine is stated to be of very little value (*L.* '05, i. 780) in the treatment, and in many cases it directly contributed to a fatal issue.

May be made use of to prevent surgical shock if it can be administered in small doses at reasonable intervals for, say, a week or 10 days previous to an operation.—*L.* '05, i. 851.

In the treatment of shock, stimulants, and especially Strychnine, are absolutely contra-indicated, as they tend to increase the severity of the condition and to retard recovery. Adrenalin, Hemisine, or Ergot are recommended.—*L.* '05, i. 854.

To the exhausted anæmic, or overworked debilitated person, Strychnine, 5 to 7 minims of the liquor, is the hypnotic *par excellence.*—*F.T.* '07, 70.

Morphinomania treated successfully by Atropine and Strychnine.—*B.M.J.* '07, i. 1173.

Strychnine, especially in form of injection and Nux Vomica, are powerful heart tonics.—*B.M.J.* '06, ii. 987.

Dose.—$\frac{1}{60}$ to $\frac{1}{15}$ grain = 0·0011 to 0·0044 gramme.

Prescribing Notes.—*May be given in the form of* **pill** *well triturated with Milk Sugar and the addition of 'Diluted Glucose,' q.s., but it is more frequently prescribed in solution.*

Antidotes.—Animal Charcoal or Tannic Acid, followed by an emetic, or the stomach-tube. Potassium Bromide, in ½ oz. in Water, with 30 grains of Chloral. 2 drm. of the Bromide, with or without 10 grains of Chloral, may be given every 15 or 20 minutes if necessary. Amyl Nitrite inhalations, the Amyl being poured freely on a handkerchief and held close to the nose. The patient may be kept fully under Chloroform or Ether. Curare, ⅓ grain, by hypodermic injection. *Artificial respiration if possible.—Murrell.*

A case of recovery after taking 3 grains of Strychnine.—*L.* '67, ii. 41, 118.

8 grains of Morphine said to be an antidote for 1 grain of Strychnine.—*L.* '71, ii. 840.

Foreign Pharmacopœias.—Official in Fr., Port., Mex., Span. and U.S.

Tests.—Strychnine melts at 265° to 266° C. (509° to 510·8° F.); the *U.S.P.* says 268° C. (514·4° F.). It dissolves very sparingly in Water, the aqueous solution being alkaline towards red Litmus paper and being lævogyrate. Even in highly dilute solution it possesses an extremely bitter taste, but the solution should be tasted with extreme caution. A crystal moistened with Sulphuric Acid produces a colourless solution, which, on the addition of a minute crystal of Potassium Bichromate, assumes an intense purple-violet coloration, passing from red to yellow. A similar coloration is produced when Sulphuric Acid containing a one-thousandth part of Potassium Permanganate is brought into contact with a crystal of the alkaloid, but the rotation of tints is very rapid and the reagent itself is apt to give a more or less purple-violet colour with Sulphuric Acid. With a drop of Sulphuric Acid containing a trace of Ammonium Vanadate (1 gramme of Ammonium Vanadate in 100 c.c.) the alkaloid produces a deep purple-violet coloration. Sulphuric Acid containing a trace of Potassium Iodate also produces with the alkaloid a purple-violet coloration, changing to reddish-purple. The free alkaloid may be determined by titration with Tenth-normal Volumetric Sulphuric Acid Solution, using Iodeosin Solution as an indicator of neutrality; 1 c.c. of Tenth-normal Volumetric Sulphuric Acid is equivalent to 0·033175 gramme of Strychnine.

The more generally occurring impurities are Brucine, Sugar and other readily charred organic impurities, and mineral impurities. The alkaloid should not be coloured on the addition of concentrated Nitric Acid, indicating the absence of Brucine. It should dissolve in cold concentrated Sulphuric Acid without alteration in colour, indicating the absence of Sugar and readily charred organic impurities. When ignited with free access of air it should leave no weighable residue.

STRYCHNINÆ HYDROCHLORIDUM.

STRYCHNINE HYDROCHLORIDE.

Hydrochlorate of Strychnine.—*B.P.* '85.

$C_{21}H_{22}N_2O_2,HCl,2H_2O$, eq. 403·70.

Translucent, colourless, prismatic crystals or white silky crystalline needles; it is efflorescent in dry air, and should therefore be kept in well-stoppered bottles. It possesses an intensely bitter taste. It is officially described as the Hydrochloride of an alkaloid obtained from Nux Vomica and from other species of Strychnos; but would have been preferably described as the Hydrochloride of the alkaloid Strychnine.

Strychnine Hydrochloride is only official in the *B.P.*; in the *U.S.P.* both the Nitrate and the Sulphate are official; in the *P.G.* only the Nitrate is official.

Solubility.—1 in 35 Water, 1 in 73 Alcohol (90 p.c.); insoluble in Ether.

Medicinal Properties.—*See* 'Strychnina.'

Dose.—$\frac{1}{60}$ to $\frac{1}{15}$ grain = 0·0011 to 0·0044 gramme.

Ph. Ger. maximum single dose, 0·01 gramme; maximum daily dose, 0·02 gramme of the Nitrate.

Prescribing Notes.—*In* **solution, tablet** *or* **pill.** *A good pill is made by well triturating with Milk Sugar and massing with 'Diluted Glucose.' Strychnine is usually given immediately after a meal. Solution of Strychnine is frequently prescribed with Solution of Arsenic, in which case the Liquor Arsenici Hydrochloricus should be ordered and not the Alkaline Liquor.*

Official Preparation.—Liquor Strychninæ Hydrochloridi.

Not Official.—Mistura Strychninæ Acida, Strychninæ Nitras, Strychninæ Sulphas, Strychnine Acetate, Strychnine Hydrobromide, Strychnine Valerianate.

Incompatibles.—Alkalis and Alkaline Carbonates, Bromides and Iodides, Liquor Sodii Arsenatis, and Liquor Arsenicalis.

Foreign Pharmacopœias.—Official in Mex.

Tests.—Strychnine Hydrochloride when heated loses its Water of crystallisation, slowly and incompletely at 100° to 110° C. (212° to 230° F.), readily and completely at 130° to 135° C. (266° to 275° F.). If of the pharmacopœial formula, it should lose theoretically 8·8 p.c., but the balance of opinion seems to be that a salt containing the full amount of Water of crystallisation is not a commercial article. The Report of the Committee of Reference in Pharmacy does not go far in elucidating the matter; it is content with stating that the composition of the salt needs reinvestigating, and that the temperature at which this salt is stated to lose its Water of crystallisation is too low. The *B.P.* authorities themselves do not appear to be over-confident of the correctness of the formula, as they state under the heading of Tests that when dried at a temperature of 100° C. (212° F.) it should lose from 7·3 to 8·8 p.c. of moisture. Commercial specimens of the salt lose about 7·3 p.c. of Water at temperatures between 100° and 130° C. (212° and 266° F.). The salt dissolves in Water, forming a clear solution, which should be neutral in reaction towards Litmus paper. It should afford on the addition of Ammonia Solution a white precipitate soluble in Ether. If the ethereal solution be separated, evaporated to dryness, it should yield a residue which answers the tests distinctive of Strychnine given under that heading. An aqueous solution of the salt acidified with Nitric Acid yields on the addition of Silver Nitrate Solution a white, curdy precipitate, which, when separated, washed and treated with Ammonia Solution, dissolves and is again reprecipitated on acidification with Nitric Acid. An aqueous solution of the salt when acidified with diluted Hydrochloric Acid should yield no turbidity on the addition of Barium Chloride Solution, indicating the absence of Sulphates.

Preparation.

LIQUOR STRYCHNINÆ HYDROCHLORIDI. Solution of Strychnine Hydrochloride. Solution of Hydrochlorate of Strychnine.—*B.P.* '85.

Strychnine Hydrochloride, $17\frac{1}{2}$ grains; Alcohol (90 p.c.), 1 fl. oz.; Distilled Water, *q.s.* to yield 4 fl. oz. (1 in 100)

Dose.—2 to 8 minims = 0·12 to 0·5 c.c.

11 minims contain $\frac{1}{10}$ grain of Strychnine Hydrochloride.
2 minims subcutaneously injected for peripheral paralysis.

Not Official.

MISTURA STRYCHNINÆ ACIDA.—Solution of Strychnine Hydrochloride, 3 minims; Diluted Nitro-Hydrochloric Acid, 15 minims; Glycerin, 30 minims; Compound Infusion of Gentian, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

STRYCHNINÆ NITRAS. Strychnine Nitrate. ($C_{21}H_{22}N_2O_2$. HNO_3, eq. 394·33).—Colourless, silky, crystalline needles, possessing an extremely bitter taste. It is the Nitrate of the alkaloid Strychnine, and is official in the *U.S.P.* and *P.G.*, but not in the *B.P.*

It should be kept in well-stoppered glass bottles.

Solubility.—1 in 63 of Water and 1 in 120 of Alcohol (90 p.c.).

Official in Austr., Belg., Dan., Dutch, Ger., Hung., Ital., Jap., Mex., Norw., Russ., Swed., Swiss and U.S.

Tests.—Strychnine Nitrate when heated decomposes. It dissolves in Water, forming a clear solution possessing even when highly diluted an extremely bitter taste (it should be tasted with extreme caution), which is neutral in reaction towards Litmus paper and lævogyrate. When heated with Hydrochloric Acid a bright red coloration is produced. The alkaloid separated from an aqueous solution of the salt by precipitation, and solution by an immiscible solvent should answer the tests distinctive of Strychnine given under that heading. A solution of the salt poured carefully upon Sulphuric Acid containing a little Diphenylamine develops a blue coloration at the junction of the two liquids. The salt when moistened with Sulphuric Acid should not assume more than a faint yellow colour, indicating the limit of Brucine. It should leave no weighable residue when ignited with free access of air, indicating the absence of mineral impurities.

Hypodermic Tablets are made containing $\frac{1}{40}$ and $\frac{1}{100}$ grain Strychnine Nitrate; and $\frac{1}{30}$, $\frac{1}{32}$, $\frac{1}{60}$, and $\frac{1}{150}$ grain of Strychnine Sulphate.

STRYCHNINÆ SULPHAS. Strychnine Sulphate [$(C_{21}H_{22}N_2O_2)_2$. H_2SO_4, $5H_2O$, eq. 850·24].—Colourless, or white, odourless, efflorescent, prismatic crystals, possessing an intensely bitter taste. It is the Sulphate of the alkaloid Strychnine.

It should be kept in well-stoppered glass bottles, as it has a tendency to effloresce in dry air.

Solubility.—1 in 48 of Water; 1 in 35 of Alcohol (90 p.c.).

Official in Fr., Mex., Port., Span. and U.S.

Tests.—Strychnine Sulphate when heated to a temperature of 100° C. (212° F.) loses its Water of crystallisation, equivalent to 10·59 p.c. Anhydrous Strychnine Sulphate melts at 200° C. (392° F.). It dissolves in Water, forming a clear solution possessing an extremely bitter taste, and which should be tasted with extreme caution. This solution is neutral in reaction towards Litmus paper. The alkaloid separated by treatment with Ammonia Solution, and an immiscible solvent should answer the tests characteristic of Strychnine given under that heading. The aqueous solution affords with Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. It should yield only a faint yellow coloration when mixed with concentrated Nitric Acid, indicating the absence of Brucine. When ignited with free access of air it should leave no weighable residue, indicating the absence of mineral impurities.

Strychnine Acetate, in colourless, acicular crystals, or as a white crystalline powder, soluble in dilute Acetic Acid; **Strychnine Hydrobromide,** in colourless, translucent, prismatic crystals, or as light, white, silky, acicular crystals, soluble 1 in 65 of Water, 1 in 96 of Alcohol (90 p.c.); and **Strychnine Valerianate,** in pearly white crystals, or as a white crystalline powder, possessing an odour of Valerianic Acid, slightly soluble in Water; are non-official salts of Strychnine, which have in recent years received attention in medical literature.

Strychninæ Meta-vanadas has been used in tuberculosis, neurasthenia and atonic dyspepsia.—*B.M.J.E.* '01, ii. 88.

STYRAX PRÆPARATUS.

PREPARED STORAX.

FR., STYRAX LIQUIDE PURIFIÉ; GER., STORAX; ITAL., STORACE LIQUIDO;
SPAN., ESTORAQUE LIQUIDO.

A light brown, or brownish-yellow semi-liquid, thick balsam, transparent in thin layers, possessing a pleasant aromatic odour, and a sharp pungent balsamic taste. It is obtained from the trunk of *Liquidambar orientalis*. The official product is purified by solution in Ethylic Alcohol, filtration and evaporation of the solvent.

Owing to loss of volatile constituents of the resin during the evaporation of the solvent, Ethylic Alcohol is unsuitable for purification of the resin, and a more volatile solvent would have been preferable, the only objection being greater inflammability. The use of Acetone has been suggested.

It contains free Cinnamic Acid, α and β Storesinol, Styrol and Styracin (Cinnamyl Cinnamate).

Medicinal Properties.—Similar in action to the Balsams of Peru and Tolu. The Ointment (1 to 4) is useful as a parasiticide in scabies and phtheiriasis.

Official Preparation.—Contained in Tinctura Benzoini Composita.

Not Official.—Unguentum Stryracis Compositum, Pommade de Styrax.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—Liquid Storax as imported consists of an opaque greyish viscid liquid, containing about 10 to 20 p.c. of Water, which settles to a certain extent at the bottom of the containing vessel. It is only after purification by solution in Alcohol, filtration and evaporation of the Alcohol, that it presents the appearance required by the *B.P.*, viz., a semi-transparent, brownish-yellow, semi-liquid balsam. It has a strong odour resembling Hyacinth and a balsamic taste. The product of a North American species, *Liquidambar styraciflua*, Linn., is sometimes imported from Guatemala and Nicaragua. It is transparent, of a golden-brown colour, and of the consistence of thick clarified Honey. In Europe it is chiefly used in perfumery; in the United States it is known as Sweet Gum and is used in the preparation of Chewing Gum.

Occasionally the bark of *Liquidambar orientalis*, Mill., from which the Storax has been expressed, is imported under the name of Storax bark, and is utilised in the preparation of fumigating pastilles and incense. The substance sold as Styrax Calamita usually consists of sawdust impregnated with liquid Storax or, more rarely, of the powdered Storax bark 3 parts beaten with Storax 2 parts to cause it to form a mass.

Tests.—Storax, according to the *B.P.*, when heated in a test-tube placed in boiling Water becomes more liquid but gives off no moisture. According to Dieterich a limit of moisture might have been introduced into the *B.P.*, and he suggests 15 p.c. as a suitable limit, his former limit of 8 p.c. being deemed too high. When boiled with Potassium Bichromate and Sulphuric Acid an odour of Benzaldehyde (Essential Oil of Bitter Almonds) is evolved. A limit for matter soluble or insoluble in Alcohol might have been included in the *B.P.* The *U.S.P.* requires that it shall contain not less than 60 p.c. of its weight of matter soluble in Alcohol (94·9 p.c.); the alcoholic residue being required to be almost completely soluble in Ether and Carbon Bisulphide, but partially soluble in Petroleum Benzin. The *P.G.* requires that when 100 parts of Storax are completely exhausted with boiling Alcohol (90 p.c.) the residue which remains shall amount at the highest to 2·5 p.c. by weight. The *P.G.* requires that when mixed with an equal weight of Alcohol (90 p.c.) it shall form a greyish-brown, cloudy liquid with an acid reaction, which, after filtering and evaporating down, leaves a transparent, semi-fluid brown mass, consisting of at least 65 p.c. by weight of the original Storax, which residue shall be soluble in Ether, Carbon Bisulphide, and Benzol, but not in Petroleum Benzin. Storax leaves 0·01 to 0·5 p.c. of ash. Useful constants are the Acid and Ester value and the proportion of Cinnamic Acid, but these are not at present included in the *B.P.*, though it has been recommended that they should be stated. The Acid value varies between 70 to 90, the Ester value from 50 to 120. The *U.S.P.* states that Storax when heated in a water-bath becomes more fluid, and when agitated with warm Petroleum Benzin the supernatant liquid, on being decanted and allowed to cool, will deposit white crystals of Cinnamic Acid and Cinnamic esters. Agitation with Petroleum Ether has been suggested (*Y.B.P.* '01, 116) as a means of detecting Resin as an adulterant. A weighed portion of the Storax mixed with coarse sand is exhausted with Petroleum Ether, the solution filtered, the solvent removed by distillation, and the Saponification value of the residue determined. The Acid value should vary from 40 to 55 and the Saponification value from 180 to 197. Specimens containing Resin as an adulterant may possess an Acid value as high as 116 to 121, and a total Saponification value as low as 172 to 178.

Not Official.

UNGUENTUM STYRACIS COMPOSITUM.—Oleum Officinale 25, Yellow Wax 15, Liquid Storax 15, Elemi 15, Venetian Turpentine 30.—*Belg.*

POMMADE DE STYRAX.—Storax 16, Colophony 29, Elemi 16, Yellow Wax 16, Olive Oil 23.—*Fr.*

SUCCI.

JUICES.

Juices expressed from fresh medicinal plants, and preserved by the addition of Alcohol, were introduced by Peter Squire in 1835 (*P.J.* vol. i.). By thus obtaining and preserving the juice of the plant, its properties are not impaired by the action of the heat employed in making an Extract.

Succus Belladonnæ, Succus Conii, Succus Hyoscyami, Succus Scoparii, and Succus Taraxaci, consist of 3 parts of Juice and 1 of Alcohol (90 p.c.).

Succus Limonis is freshly expressed and contains no Alcohol.

The **Alcoolatures** of the Fr. are made by digesting equal weights of fresh plant and Rectified Spirit together for 8 or 10 days; pressing and filtering. Aconite, Belladonna, Conium (Ciguë), Digitalis, Eucalyptus, Henbane (Jusquiame), Stramonium Leaves, Flowers, and Corms of Colchicum, are so prepared.

Not Official.

SUCCINUM.

AMBER.

Translucent or opaque, hard brittle, yellow, yellowish-brown or yellowish-red solid, breaking with lustrous conchoidal fracture.

A fossil resinous exudation from *Pinites succinifer*, Gœppert, an extinct coniferous tree, on the shores of the Baltic.

Foreign Pharmacopœias.—Official in Dutch, Mex. (Ambar Amarillo), Port. (Ambar), and Swed.

OLEUM SUCCINI RECT.—A transparent, pale yellow or brownish-yellow limpid oily liquid, possessing a characteristic disagreeable odour and burning acrid taste. It is a volatile Oil obtained by the destructive distillation of Amber, and purified by subsequent rectification.

A cheaper and inferior product is sold under the name of Ol. Succini, which forms a fractional portion of resin spirit obtained by the distillation of ordinary resin.—*P.J.* (4), viii., p. 98.

Externally it is stimulant and rubefacient.

Dose.—1 to 3 minims = 0·06 to 0·18 c.c.

Foreign Pharmacopœias.—Official in Hung., Mex., Norw. and Port.

Tests.—Rectified Oil of Amber has a sp. gr. of about 0·905. It boils between 170° and 186° C. (338° and 366·8° F.). It has a characteristic unpleasant odour, and a hot acrid taste. It is soluble in all proportions of Ether, Chloroform and Carbon Bisulphide.

LINIMENTUM SUCCINI.—Oil of Amber, 1; Spirit of Camphor, 1; Spirit of Hartshorn, 1.

A domestic **embrocation** for whooping-cough.

LINIMENTUM SUCCINI COMPOSITUM.—Oil of Amber, $\frac{1}{2}$; Oil of Cloves, $\frac{1}{2}$; Olive Oil, 1.—This formula is given in *Pharm. Form.* as a traditional imitation of Roche's Embrocation, and is now incorporated in the *B.P.C.*

TINCTURA SUCCINI.—Amber, 1; Alcohol (90 p.c.), 16.

Dose.—25 minims = 1·5 c.c. in Water for headache.

Foreign Pharmacopœias.—Official in Dutch, 1 Amber and 5; Port., 2·8 Oil in 10; Swed., 1 Amber in 5.

SULPHONAL.

SULPHONAL.

SULPHONMETHANUM, SULPHONMETHANE.

$C_7H_{16}S_2O_4$, eq. 226·53.

FR., DIÉTHYLSULFONE-DIMÉTHYLMÉTHANE; GER., SULFONAL;
ITAL., SOLFONALE; SPAN., SULFONAL.

Colourless, odourless, almost tasteless, prismatic crystals; or a white odourless crystalline powder. Permanent in the air.

The *B.P.* describes Sulphonal as Dimethyl-methane-diethylsulphone, a product of the oxidation of Mercaptol obtained from Acetone and Mercaptan. The *U.S.P.* describes it as Diethylsulphonedimethylmethane, a product of the condensation of Acetone with Ethylmercaptan. The *P.G.* does not state its origin.

It should be kept in well-stoppered glass bottles.

It belongs to the class of Di-sulphones to which Trional and Tetronal also belong.

It is officially required to be in crystals, but it is generally supplied in *powder*; its action is stated to be quicker and more certain in that form than when administered in crystals.

Solubility.—1 in 500 of Water; 1 in 15 of boiling Water; 1 in 50 of Alcohol (90 p.c.); 1 in 3 of Chloroform; 1 in 90 of Ether.

Medicinal Properties.—A pure hypnotic for simple insomnia, when pain is absent. As in repeated doses it may be cumulative, and produce hæmatoporphyrinuria and other toxic effects, it is not the hypnotic to select for continued use. It is more soluble in warm than in cold Water, and still more so in warm alcoholic drinks, the latter being the best way of administration. If taken in the form of a powder or tablet, the action may, owing to comparative insolubility, be deferred for 1 or 2 hours, but if taken in hot solution the action is far more rapid.

Toxic effects following the administration of 35 grains given in divided doses of 20 and 15 grains at an interval of 24 hours. Recovery.—*B.M.J.* '99, i. 209.

A case in which a quantity of 300 grains was taken in 2 doses of 150 grains; only slight drowsiness supervening owing to prompt action of emetics.—*B.M.J.* '00, i. 136.

Toxic cumulative effect of Sulphonal and Trional. The only treatment of any avail for Sulphonal poisoning is the free exhibition of alkalis; when there is vomiting and great difficulty in getting the alkali taken in sufficient quantity the intravenous or interstitial transfusion of an alkaline solution might be tried.—*B.M.J.* '92, ii. 1250.

A fatal case of hæmatoporphyrinuria following its use, also a record of another fatal case in which only 30 grains had been taken in 2 doses.—*B.M.J.* '01, i. 1473; *T.G.* '01, 618.

Valuable in early cases of insanity, but in ordinary acute insanity, with extreme restlessness and sleeplessness, Sulphonal even in moderate doses was injurious. The prolonged use of Sulphonal was pernicious from the point of view of auto-intoxication.—*L.* 02, i. 1539.

May be tried for the sleeplessness of uræmic patients; the dose should not be large.—*Pr.* lxvii. 658.

A serious feature in most of the fatal cases of poisoning is that usually the patients have been under treatment for some time and have been apparently benefited by the drug up to the time of the appearance of toxic symptoms.—*L.* '03, i. 1023; *B.M.J.* '03, i. 853.

The urine of patients taking Sulphonal is stated to reduce Fehling's Solution.—*B.M.J.E.* '95, ii. 43; *P.J.* (3) xxv. 1124.

Of the Sulphur hypnotics, Sulphonal was uncertain in its action and caused tissue changes as evidenced by hæmatoporphyrinuria.—*B.M.J.* '05. ii. 250.

Dose.—10 to 30 grains = 0·65 to 2 grammes.

Prescribing Notes.—*It is given in* **mixtures** *suspended with Compound Tragacanth Powder* 60 *grains to* 6 *fl. oz. of Water. Also in* **cachets, capsules,** *Compressed Tablets, or in* **powders,** *to be taken perhaps best of all in hot Water, or hot Spirits and Water.*

Not Official.—Trional and Tetronal.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr. (Diethylsulfone-diméthylméthane), Ger., Ital. (Solfonale), Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S. (Sulphonmethanum).

Tests.—Commercial Sulphonal melts at 125·07° C. (257·13° F.), dried Sulphonal at 125·24° C. (257·43° F.), purified Sulphonal at

125·26° C. (257·47° F.). The *B.P.* m.p. is 125·5° C. (258° F.), this figure is also given in the *U.S.P.* The *P.G.* states 125° to 126° C. (257° to 258·8° F.). At a higher temperature it burns away, emitting an odour of Sulphur Dioxide. When a small quantity is heated with a little powdered Charcoal in a dry tube, or when a mixture of equal weights of Sulphonal and Potassium Cyanide are heated, the characteristic and disagreeable odour of Mercaptan is evolved; if the residue from the latter be dissolved in Water, an excess of Hydrochloric Acid added it yields on the addition of a few drops of Ferric Chloride T.S. a reddish colour. When gradually warmed with dried Sodium Acetate it evolves Hydrogen Sulphide. The saturated aqueous solution should be neutral in reaction towards Litmus paper.

The more generally occurring impurities are Chlorides and Sulphates, readily oxidisable organic impurities, Mercaptan or Mercaptol and mineral impurities. The saturated aqueous solution should yield no turbidity upon the addition of Silver Nitrate Solution or Barium Chloride Solution, indicating the absence of Chlorides and Sulphates. Readily oxidisable organic impurities may be detected by the test with Potassium Permanganate given in the small type below. The substance should leave no weighable residue when heated with free access of air, indicating the absence of mineral impurity, and the solution in boiling Water should be free from odour, indicating the absence of Mercaptan and Mercaptol.

Potassium Permanganate.—If 1 drop of Potassium Permanganate be added to an aqueous solution (to 10 c.c. of an aqueous solution 1-50, *P.G.*), the liquid should not be immediately decolorised, *P.G.* and *U.S.P.*

Not Official.

TRIONAL, Methyl-Sulphonal, Sulphonethylmethanum, Sulphonethylmethane ($C_8H_{18}S_2O_4$, eq. 240·44).—A white crystalline powder with a faintly bitter taste. Is analogous in composition to Sulphonal, but with a Methyl group replaced by Ethyl.

The *U.S.P.* describes Trional under the heading of Sulphonethylmethanum as Diethylsulphonemethylethylmethane, a product of the oxidation of the Mercaptol obtained by the condensation of Methylethylketone with Ethyl Mercaptan.

It should be kept in well-stoppered glass bottles.

It is not official in the *B.P.*

Solubility.—1 in 320 of Water; 1 in 11 of Alcohol (45 p.c.).

Medicinal Properties.—A pure hypnotic like Sulphonal, but, being more soluble, acts more rapidly. Useful in melancholia, mania, and in many nervous affections, in delirium tremens, in sleeplessness of children; it may induce constipation.

In the insomnia of tricuspid incompetency 10 grains given at bedtime yield successful results.—*M.P.* '04, ii. 515. It requires watching, as cases of artificial nephritis are recorded.

Poisonous effects not produced if used cautiously.—*B.M.J.E.* '96, i. 27.

In insomnia and delirium due to alcoholism and nicotinism, 10 to 30 grains given at first; after a few trials 15 grains every 4 hours and up to 90 grains per diem were given.—*L.* '01, ii. 223.

5 to 10 grains thrice daily in chorea.—*B.M.J.* '01, ii. 1805; '02, i. 267.

15 grains every other night for 15 weeks produced toxic symptoms.—*L.* '03, i. 1023; *B.M.J.* '03, i. 853.

Acute poisoning caused by taking 25 5-grain tablets in 1 dose. Recovery.—*L.* '03, i. 1096.

Dose.—For children, 5 to 10 grains = 0·32 to 0·65 gramme; for adults, 15 to 30 grains = 1 to 2 grammes, usually given in cachets followed by a hot drink, or suspended with Tragacanth like Sulphonal.

Ph. Ger. maximum single dose, 2 grammes; maximum daily dose, 4 grammes.

Foreign Pharmacopœias.—Official in Austr. and Span. (Trional); Belg., Dutch, Ger., Jap. (Methylsulfonalum); Fr. (Diéthylsulfone-éthylméthylméthane); Swiss, Diäthylsulfonmethyläthylmethanum; U.S. (Sulphonethylmethanum).

Tests.—Trional melts at 76·5° C. (169·7° F.). The *U.S.P.* and the *P.G.* give 76° C. (168·8° F.). At a red heat it evolves an odour of Sulphur Dioxide. When heated with an equal quantity of powdered Charcoal in a dry test-tube it evolves the characteristic disagreeable odour of Mercaptan, and when gradually heated with dried Sodium Acetate it emits a characteristic and disagreeable odour of Hydrogen Sulphide. In the directions for performing this test in the case of Sulphonal, the *U.S.P.* directs the use of dry Sodium Acetate, whilst, in the case of Trional, the use of dried Sodium Acetate is directed.

The more generally occurring impurities are Chlorides and Sulphates, readily oxidisable organic impurities, Mercaptan or Mercaptol and mineral impurities. The saturated aqueous solution should not afford a turbidity with Silver Nitrate Solution or with Barium Chloride Solution, indicating the absence of Chlorides and Sulphates. It should not decolorise 1 drop of a 1 in 1000 Potassium Permanganate Solution, indicating the absence of readily oxidisable organic impurities. 1 gramme dissolved in 50 c.c. of boiling Water should evolve no odour, indicating the absence of Mercaptan and Mercaptol. When ignited with free access of air it should leave no weighable residue, indicating the absence of mineral impurities.

TETRONAL (Diethylsulphon-diethylmethane).—It is analogous in composition to Sulphonal, but with 2 Methyl groups replaced by Ethyl. A white crystalline odourless powder. Soluble 1 in 550 of Water; 1 in 12 of Alcohol (90 p.c.).

It is a hypnotic resembling Sulphonal.

Dose.—10 to 20 grains = 0·65 to 1·3 gramme.

Tests.—Tetronal melts at 85° C. (185° F.). It is but sparingly soluble in Water, but dissolves in Alcohol, forming a solution which is neutral in reaction towards Litmus paper. When heated with an equal weight of powdered Charcoal in a test-tube it evolves the characteristic and unpleasant odour of Mercaptan. When gradually heated with dry Sodium Acetate it evolves the characteristic unpleasant odour of Hydrogen Sulphide. When boiled with 50 times its own weight of Water no unpleasant odour should be developed, indicating the absence of Mercaptan and Mercaptol. The saturated aqueous solution should yield no turbidity on the addition of Silver Nitrate Solution, or on the addition of Barium Chloride Solution, indicating the absence of Chlorides and Sulphates, nor should it immediately decolorise 1 drop of a 1 in 1000 Potassium Permanganate Solution, indicating the absence of readily oxidisable organic impurities.

Not Official.

SULPHUR.

SULPHUR.

S, eq. 31·82.

Sulphur occurs native, and is found in masses or in the powdery form mixed with various impurities. It is abundant in volcanic countries, as in Sicily, and in some parts of Italy. It readily volatilises, and when the vapours are passed into a large brick chamber kept cold, it condenses in fine powder (Sublimed Sulphur), and when a small chamber is used and kept at a temperature of about 120° C. (248° F.), it condenses in the liquid form and is run into moulds (Roll Sulphur).

Foreign Pharmacopœias.—Official in Belg., Sulphur; Ital. (Solfo); Port. (Enxofre); Mex. and Span., Azufre; Swed.

SULPHUR PRÆCIPITATUM.

PRECIPITATED SULPHUR.

B.P.Syn.—Milk of Sulphur.

A light-grey, or greyish-yellow, smooth, amorphous powder, sometimes possessing a slight odour of Hydrogen Sulphide.

It is prepared by precipitating the Sulphur from solution of Calcium Sulphide and Thiosulphate by means of Hydrochloric Acid; the former solution is prepared by boiling Sulphur with Lime.

Lac Sulphuris of former Pharmacopœias contained a large amount of Calcium Sulphate, owing to Sulphuric Acid being used in its preparation, but as Hydrochloric Acid is now employed, no distinction should be made between Milk of Sulphur and Precipitated Sulphur.

Medicinal Properties.—Similar to those of Sulphur Sublimatum, only more active. Mixed with Milk and rubbed till smooth, children take it readily.

Dose.—20 to 60 grains = 1·3 to 4 grammes.

Official Preparation.—Trochiscus Sulphuris.

Not Official.—Lotio Sulphuris, Trochiscus Sulphuris Compositus, Pastillus Sulphuris Compositus, Sulphur Hair Lotion, Lotio Plumbi et Sulphuris, Unguentum Sulphuris Præcipitati, Unguentum Sulphuris Camphoratum, and Unguentum Sulphuris et Resorcini.

Foreign Pharmacopœias.—Official in Fr. (Soufre Précipité); Ital. (Solfo Precipitato); Port. (Enxofre Precipitado); Mex. and Span. (Azufre Precipitado).

Tests.—Precipitated Sulphur melts at 115° C. (239° F.). It should be readily and completely soluble in Carbon Bisulphide. When ignited it burns with a blue flame, emitting a penetrating distinctive odour of Sulphur Dioxide. When evaporated to dryness with Nitric Acid the residue dissolved in Water and the solution filtered, it yields on the addition of Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. The *B.P.* requires that under the microscope it shall consist of opaque globules without crystalline matter. The *U.S.P.* requires that it shall contain not less than 99·5 p.c. of pure Sulphur, but does not indicate a method of determination. Neither the *B.P.* nor the *P.G.* gives the percentage required.

The more generally occurring impurities are acid or alkali, Arsenic, Calcium, Chlorides, Sulphates and mineral impurity. The presence of acid or alkali may be detected by the reaction with Litmus given in small type below. Arsenic may be detected by the Hydrogen Sulphide test described below. If a portion of the specimen be shaken with Water acidified with Nitric Acid and filtered, the filtrate should yield only the faintest turbidity with Silver Nitrate Solution, indicating the absence of more than traces of Chlorides; neither should it yield a turbidity with Ammonium Oxalate Solution. When ignited with free access of air it should leave no weighable residue.

Litmus.—If 5 c.c. of Water be agitated with 2 grammes of Precipitated Sulphur, the liquid should not change the colour of blue or red Litmus paper, *U.S.P.*; moistened with Water, it should not redden blue Litmus paper, *P.G.*

Hydrogen Sulphide.—Precipitated Sulphur allowed to stand with 20 parts of Ammonia T.S. at 35° to 40° C. (95° to 104° F.), with intervals of occasional shaking, gives a filtrate which should not be coloured yellow when acidulated with Hydrochloric Acid or on the subsequent addition of T.S. of Hydrogen Sulphide, *P.G.* If 1 gramme be digested for several hours with 10 c.c. of Ammonia Water and the liquid filtered, one half of the clear filtrate should not leave a residue on evaporation; if the remainder be evaporated to dryness on a water-bath, then after adding 1 c.c. of Nitric Acid and again evaporating, the solution obtained by dissolving the residue in 10 c.c. of Hydrochloric Acid (8 p.c.) should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Preparation.

TROCHISCUS SULPHURIS. SULPHUR LOZENGE.

Contains 5 grains of Precipitated Sulphur, and 1 grain Acid Potassium Tartrate in each, flavoured with Tincture of Orange.

Dose.—1 to 6 lozenges.

Belg. has Sulphuris Tabellæ, 0·1 gramme = 1½ grains in each; Fr. has Tablettes de Soufre, 0·1 gramme = 1½ grains in each; Mex. has Pastillas de Azufre, 0·1 gramme = 1½ grains in each.

Not Official.

LOTIO SULPHURIS.—Precipitated Sulphur, ½ oz.; Glycerin, 120 minims; Alcohol (90 p.c.), 1 fl. oz.; Rose Water, 3 fl. oz.; Lime Water, 3 fl. oz. Recommended in acne of the face.—*L.* '87, i. 66.

This has been incorporated in the *B.P.C.* as follows:—Precipitated Sulphur, 6; Glycerin, 3; Alcohol, 12·50; Rose Water, 40; Lime Water, *q.s.* to produce 100.

TROCHISCUS SULPHURIS COMPOSITUS.—Each lozenge contains 5 grains of Precipitated Sulphur, and 1 grain of Cream of Tartar.

These lozenges differ from the official Sulphur lozenge in that they contain no Orange, and are therefore preferred by many.

A convenient form of administering Sulphur as a general laxative, in cases of sluggish liver, bleeding piles, and habitual constipation.—*L.* '89, i. 665.

PASTILLUS SULPHURIS COMPOSITUS.—Precipitated Sulphur, 5 grains; Acid Potassium Tartrate, 1 grain.—*Martindale* and *B.P.C.*

SULPHUR HAIR LOTION.—Acetate of Lead, 1½ drm.; Milk of Sulphur, (Calcareous), 3 drm.; Glycerin, 10 drm.; Heliotrope Perfume, 2 drm.; Water, to 10 oz.—*Pharm. Form.*

Lotio Plumbi et Sulphuris. *Syn.* Sulphur Hair Restorer.—Lead Acetate, 1·75; Precipitated Sulphur, 3·50; Glycerin, 12·50; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

UNGUENTUM SULPHURIS CAMPHORATUM.—Precipitated Sulphur, 10 grains; Carbolic Acid, 15 grains; Resorcin, 15 grains; Camphor, 15 grains; Solution of Coal Tar, 25 minims; Benzoated Lard, 240 grains; Soft Paraffin, white, 240 grains.—*St. Mary's.*

This has been incorporated in the *B.P.C.*

UNGUENTUM SULPHURIS ET RESORCINI.—Precipitated Sulphur, 20 grains; Resorcin, 15 grains; Soft Paraffin, yellow, to 1 oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.* as follows:—Precipitated Sulphur, 4·50; Resorcin, 3; Soft Paraffin, yellow, to produce 100.

UNGUENTUM SULPHURIS PRÆCIPITATI.—Precipitated Sulphur, 2; Potassium Carbonate, 1; Lard, 8. Excellent for scabies.

SULPHUR SUBLIMATUM.

SUBLIMED SULPHUR.

B.P.Syn.—Flowers of Sulphur.

A bright yellow or greenish-yellow amorphous powder, possessing a faint characteristic odour.

It may be prepared from native Sulphur or Sulphides.

Solubility.—Insoluble in Water. Slightly soluble in hot Alcohol. Only partially soluble in Carbon Bisulphide.

Medicinal Properties.—Laxative, alterative, diaphoretic, expectorant. Employed internally in hæmorrhoids and chronic rheumatism, hepatic congestion, gout, chronic bronchitis and many skin diseases; externally also for skin diseases, especially scabies and acne.

Dusted on the membrane in diphtheria.—*B.M.J.* '93, ii. 993; '94, i. 459; *L.* '95, i. 265, 327. 20 grains with or without 5 grains of Dover's Powder 3 times daily in dysentery.—*L.* '01, ii. 1406.

In typhoid fever, 20 grains every 2 hours up to 154 grains in the day for adults, for children 5 to 7½ grains every 2 hours up to 60 grains in the day.—*B.M.J.E.* '02, ii. 83.

Dose.—20 to 60 grains = 1·3 to 4 grammes.

Official Preparations.—Confectio Sulphuris and Unguentum Sulphuris; contained in Pulvis Glycyrrhizæ Compositus. Used in the preparation of Acidum Sulphuricum, Acidum Sulphurosum, Emplastrum Ammoniaci cum Hydrargyro, Emplastrum Hydrargyri, Antimonium Sulphuratum, Potassa Sulphurata, Sulphur Præcipitatum and Sulphuris Iodidum.

Not Official.—'Chelsea Pensioner,' Unguentum Sulphuris Compositum, Vasolimentum Sulphuris, Vasolimentum Sulphuris Compositum, Parogenum Sulphuris, Parogenum Sulphuris Compositum.

Foreign Pharmacopœias.—Official in all. Austr. (Sulphur Depuratum); Belg. (Sulphur Lotum); Dan. (Sulphur Sublimatum), also Sulphur Sublimatum Venale; Dutch, Ger., Jap. and Russ. (Sulphur Sublimatum, also Sulphur Depuratum); Fr. (Soufre Sublimé and Soufre Sublimé Lavé); Hung. (Sulphur Sublimatum, also Sulphur Sublimatum Lotum); Ital. (Solfo Sublimato, also Solfo Sublimato e Lavato); Mex. (Azufre Sublimado y Lavado); Norw. (Sulphur Sublimatum); Port. (Enxofre Sublimado, also Enxofre Lavado); Span. (Azufre Sublimado, also Azufre Lavado); Swed. (Sulphur Sublimatum, also Sulphur Sublimatum Elotum); Swiss (Sulphur Sublimatum Crudum, also Sulphur Lotum); U.S. (Sulphur Sublimatum, also Sulphur Lotum).

Tests.—Sublimed Sulphur melts at about 115° C. (239° F.). When ignited it burns with a blue flame, evolving a distinctive penetrating odour of Sulphur Dioxide, which blackens a strip of paper moistened with Mercurous Nitrate Solution. When oxidised with Nitric Acid, the residue dissolved in Water yields, with Barium Chloride Solution, a dense white precipitate insoluble in Hydrochloric Acid. It is officially required to consist of almost opaque, irregular particles, and to be free from admixture of crystalline matter when examined under the microscope. The *U.S.P.* requires that it shall contain not less than 99 p.c. of pure Sulphur, but does not indicate a method for its determination. Neither the *B.P.* nor *P.G.* states the requisite percentage nor a method of determination.

The more generally occurring impurities are acid or alkali, Arsenic and mineral matter. If the specimen be shaken with Water and filtered, the filtrate should possess neither an acid nor an alkaline reaction towards Litmus paper, indicating the absence of acid or alkali. The *B.P.* test of freedom from acidity can only be expected from washed Sulphur, which is official in most Foreign Pharmacopœias. Commercial Sublimed Sulphur is always more or less acid. Sublimed Sulphur always gives an acid reaction unless freshly washed and dried. When shaken with Ammonia Solution and filtered, the filtrate should not, on acidification with Hydrochloric Acid, afford a yellow precipitate or turbidity, nor should another portion yield a residue when evaporated to dryness, indicating the absence of Arsenic Sulphide. The residue left in this Ammonia test might be Ammonium Sulphate, and is no proof of the presence of Arsenic or Arsenic Sulphide. The Arsenic test is not delicate enough. A standard has been suggested (*C.D.* '08, i. 796) of 2 parts per million for Arsenic. When ignited with free access of air Sulphur should burn leaving no weighable residue.

Preparations.

CONFECTIO SULPHURIS. CONFECTION OF SULPHUR.

Sublimed Sulphur, 4 oz.; Acid Potassium Tartrate, 1 oz.; Tragacanth, in powder, 18 grains; Syrup, 2 fl. oz.; Tincture of Orange, ½ fl. oz.; Glycerin, 1½ fl. oz. (1 in 2¼)

Now made with Glycerin, Syrup, and Tincture of Orange in place of Syrup of Orange Peel.

Dose.—60 to 120 grains = 4 to 8 grammes.

UNGUENTUM SULPHURIS. SULPHUR OINTMENT.

Sublimed Sulphur, finely sifted, 1; Benzoated Lard, 9. (1 in 10)

In *B.P.* '85 it was 1 in 5.

Precipitated Sulphur makes a more active Ointment, and Essence of Lemon covers the odour.

An **ointment** ¼ of *B.P.* '85 strength exerts a destructive effect on the ringworm fungus.—*B.M.J.* '89, i. 398.

Foreign Pharmacopœias.—Official in Belg. (Sulphuris Alcalini Unguentum), Potassium Carbonate 10, Water 5, Sulphur 20, Lard 65; Jap. and Russ., Sulphur 1, Lard 2; Fr., Sulphur 1, Almond Oil 1, Benzoinated Lard 8; Mex., Sulphur 1, Benzoinated Lard 3; Port. and Swiss., Sulphur 3, Lard 7; Port. has also compound ointment 1 in 5; Russ. has also compound ointment 1 in 10; Span., Sulphur 1, Lard 4; U.S., Sulphur 3, Benzoinated Lard 17.

Not Official.

'CHELSEA PENSIONER.'—Sulphur, 6; Mustard, 6; Powdered Guaiacum, 3; Rhubarb, 1½; Nitre, 1½: mix. Honey or Treacle sufficient to make it into an Electuary.

Dose.—A teaspoonful every alternate night for rheumatism; it is also taken in the morning as an aperient to regulate the bowels.

See also GUAIACUM, p. 583.

UNGUENTUM SULPHURIS COMPOSITUM. *Syn.* UNG. AD SCABIEM VIENNENSE. WILKINSON'S OINTMENT.

Sulphur, 15; Chalk, 10; Tar, 15; Lard, 30; Soap, 30.

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Austr., Sulphur 16, Chalk 4, Tar 16, Lard 16, Mutton Suet 16, Potash Soap 32; Dutch, Sulphur 15, Pulvis Marmoris 20, Yellow Vaseline 30, Potash Soap 20, Oil of Cade 15; Hung., Sulphur 15, Chalk 10, Potash Soap 30, Lard 20, Yellow Wax 10, Tar 15; Norw. and Swed., Sulphur 15, Chalk 10, Tar 15, Lard 30, Soap 30; Swiss, Sulphur 10, Zinc Sulphur 10, Soap 15, Lard 65.

UNGUENTUM SULPHURIS COMPOSITUM.—Sulphur, 4 oz.; Powdered White Hellebore, 10 drm.; Nitrate of Potash, 2 scruples; Soft Soap, 4 oz.; Lard, 12 oz.; all by troy weight.—*P.L.* 1851.

VASOLIMENTUM SULPHURIS.—Sublimed Sulphur, 3; Linseed Oil, 37; Simple Vasoliment, *q.s.* to make 100. Heat the Sulphur and Linseed Oil together until dissolved, and make up with Simple Vasoliment.—*Y.B.P.* '01, 212.

Parogenum Sulphuris. *Syn.* Sulphur Vasoliment.—Sublimed Sulphur' 3; Linseed Oil, 37; Parogen, *q.s.* to produce 100.—*B.P.C.*

VASOLIMENTUM SULPHURIS COMPOSITUM.—Sulphur Vasoliment, 10; Cade Oil, 10; Thymol, 0·3; Eucalyptol, 3; Turpentine, 30; and make up with Vasoliment to 100.—*Y.B.P.* '01, 212.

Parogenum Sulphuris Compositum. *Syn.* Compound Sulphur Vasoliment.—Sulphur Parogen, 10; Oil of Cade, 10; Thymol, 0·3; Eucalyptol, 3; Oil of Turpentine, 30; Parogen, *q.s.* to produce 100.—*B.P.C.*

Not Official.

SULPHURIS CHLORIDUM.

SULPHUR CHLORIDE.

S_2Cl_2, eq. 134·02.

A mobile reddish-yellow liquid, sp. gr. 1·69, with a penetrating disagreeable odour, and fuming strongly in air. Prepared by the direct union of Chlorine with Sulphur. It dissolves without decomposition in Carbon Bisulphide or Benzol, but is decomposed by Water, Alcohol or Ether.

UNGUENTUM SULPHURIS HYPOCHLORITIS.—Sublimed Sulphur, 1 oz.; Sulphur Chloride, 1 fl. drm.; Spermaceti Ointment (*B.P.* 1867), 8 oz.; Essential Oil of Almonds, 80 minims, is usually added to mask the disagreeable odour.

Used in the treatment of scabies and acne.

Occasionally made of twice this strength.

Sublimed Sulphur, 12; Sulphur Chloride, 2; Essential Oil of Almonds, by weight, 2; Lard, 84.—*B.P.C.*

SULPHURIS IODIDUM.

SULPHUR IODIDE.

Greyish-black crystalline masses, possessing a metallic lustre and evolving a strong odour of Iodine. It should be kept in well-stoppered bottles in a cool place. Like Iodine, it stains the skin. It is prepared by direct combination of Iodine and Sulphur by heating them together.

The proportions of Iodine and Sulphur are used in equivalents to form SI, eq. 157·72, but the combination is a very loose one.

Solubility.—1 in 16 of Glycerin; 1 in 4 of Carbon Bisulphide. Insoluble in cold Water.

Medicinal Properties.—The Ointment is an excellent remedy for acne rosacea, and for parasitic, tubercular and other diseases of the skin.

Official Preparation.—Unguentum Sulphuris Iodidi.

Foreign Pharmacopœias.—Official in Mex. (Yoduro de Azufre); Port. (Enxofre Iodado); U.S. (Sulphuris Iodidum).

Tests.—Sulphur Iodide when exposed to the air gradually loses Iodine. When heated the Iodine sublimes first. When boiled with Water the Iodine passes off in vapour, the Sulphur remaining as an insoluble residue. The amount of this residue is officially required to be about one-fifth of the weight of the original Sulphur Iodide. The *U.S.P.* states that continued boiling with Water vaporises all the Iodide, leaving about 20 p.c. of Sulphur as a residue. It is completely soluble in Carbon Bisulphide. No requisite percentage of pure Sulphur Iodide is mentioned in the *B.P.*, but a rough method of determination is given based upon the insoluble residue remaining when the Sulphur Iodide is boiled with Water, which is officially required to amount to about one-fifth of the weight of the sample taken. Solution in Potassium Iodide and titration with Sodium Thiosulphate would be a better test for quality than the determination of residual Sulphur. The *U.S.P.* requires that it shall contain not less than 70·5 p.c. of Iodine as volumetrically determined by dissolving a mixture of 0·5 of a gramme of the finely-powdered Sulphur Iodide and 1 gramme of Potassium Iodide in 20 c.c. of Water and titrating with Tenth-normal Volumetric Sodium Thiosulphate Solution, using Starch Mucilage as an indicator, not less than 28 c.c. should be required; 1 c.c. of Tenth-normal Volumetric Sodium Thiosulphate corresponds to 0·01259 gramme of Iodine. This percentage of Iodine corresponds to about 88·3 p.c. of Sulphur Iodide of the formula given above.

Preparation.

UNGUENTUM SULPHURIS IODIDI. SULPHUR IODIDE OINTMENT.

Rub 20 grains of Sulphur Iodide with 20 grains of Glycerin to a smooth paste in a warmed mortar, and gradually add 460 grains of Benzoated Lard, and stir until cold.

B.P. (1898) reduced the strength from 1 in 15½ to 1 in 25. Glycerin was added and Benzoated Lard replaced Hard and Soft Paraffin.

It is apt to be gritty unless carefully made; it becomes darker on keeping.

SUMBUL RADIX.

SUMBUL ROOT.

The dried transverse slices of the Root of *Ferula Sumbul.*

Imported from Russia. It possesses a powerful odour resembling Musk. An inferior kind has of late years replaced the old Sumbul root.

Medicinal Properties.—Carminative and antispasmodic, said to be useful in hysteria and allied nervous complaints.

Official Preparation.—Tinctura Sumbul.

Foreign Pharmacopœias.—Official in Mex.; Port. (Sombula); U.S. has Extract and Fluid Extract.

Descriptive Notes.—The Sumbul Root of commerce is probably not that of the official species, *Ferula Sumbul*, Hook. f., which apparently has not been collected for many years (an undetermined species, *U.S.P.*). The segments of the root of Ferula Sumbul are 3 to 4 in. (75 to 100 mm.) in diameter, 1½ to 2 in. (37 to 50 mm.) in thickness (1 to 3 in. (25 to 75 mm.) in diameter, ¾ to 1 in. (18 to 25 mm.) or more in thickness *B.P.*). Externally the bark is papery, pale brown, annulated in the upper or rootstock portion and sometimes bristly with the remains of the leaf-stalks near the apex. The transverse section is spongy and fibrous, and shows an irregular, somewhat contorted arrangement of the vascular tissue, and owing to the exudation of oleoresin it is usually marbled with blackish patches. The root yields about 9 p.c. of soft resin and ⅓ p.c. of a dingy, bluish, essential oil. It has a bitter and musky taste and a musky odour. The article at present in commerce is probably the root of *Ferula suaveolens*, This has quite a weak musky odour and occurs in smaller pieces, although in general appearance resembling the official kind. Occasionally there has appeared a false Sumbul in commerce, the Indian Sumbul of Pereira, which consists of the root of *Dorema Ammoniacum*, scented with tincture of Musk; it closely resembles Sumbul in appearance, but when kept in a bottle or closed vessel the odour of Ammoniacum soon overcomes that of the Musk and is easily recognised; the characteristic taste of Ammoniacum is also easily detected. This root is largely imported into Bombay and is used as incense by the Parsees in their fire temples.

Tests.—Sumbul Root contains from 5 to 6 p.c. of ash.

Preparation.

TINCTURA SUMBUL. Tincture of Sumbul.
Sumbul Root, 1; Alcohol (70 p.c.), 10; by maceration.

Now 1 in 10 instead of 1 in 8, and Alcohol (70 p.c.) used in place of Rectified Spirit.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Tincture of Sumbul has a sp. gr. of 0·895 to 0·900; it contains about 2·5 p.c. w/v of total solids and about 66 p.c. w/v of Absolute Alcohol.

SUPPOSITORIA.

Suppositories are for the most part prepared by the following general formula:—

Melt the Oil of Theobroma; triturate the active ingredient intimately with a little of the Oil, and add the mixture to the remainder of the melted Oil in a basin or dish; stir well, and as the mixture begins to thicken pour it into the moulds, which may then be cooled with Water, or in summer by iced Water.

All difficulty in removing the suppositories from the moulds may be obviated by having the moulds previously wiped with oiled Lint.

It is convenient to weigh out ingredients for one or two more suppositories than are required by the prescription. The so-called 15-grain moulds, sold for suppositories, do not always hold exactly 15 grains; it is advisable to check their capacity.

In those rare circumstances where moulds are not available, the mixture may be allowed to cool, divided into the requisite number of parts, and shaped into a suitable form.

Hollow cones of suppository shape are made with Oil of Theobroma in various sizes; these can be filled with any desired medicament and closed with a plug; they are known as '**hollow suppositories.**'

In India and the Colonies a quantity of Beeswax may be added to suit the temperatures for the time being, so as to produce a desirable consistence.

Cocoa-nut **Stearin** (p. 1154), or a mixture of this with Oil of Theobroma, is a better basis for suppositories than Oil of Theobroma in cold weather.

Not Official.

SUPRARENAL GLAND.

The suprarenal or adrenal bodies or capsules are ductless glands each consisting of two portions which are distinct from a physiological point of view, the cortex and the medulla. A suprarenal body is thus two distinct and independent organs combined with one another. The fresh healthy glands of the ox or sheep are generally used for preparations. The substance causing a rise of blood pressure (Adrenalin) is found in the medulla only; regarding the functions of the relatively large cortical portion of the gland we have no definite information, although some comparative observations indicate that it may have important specific relations to the growth of the body, particularly to the genital organs. The active principle may be boiled without losing its activity, thus allowing the comparatively easy preparation of sterilised solutions; it is, however, prone to absorb Oxygen from the air and to become less active.

Medicinal Properties.—A powerful vaso-constrictor and cardiac tonic. It is of the greatest value in cases of sudden cardiac failure. An extract of the glands was first used in the treatment of Addison's disease, and numerous early cases are recorded, some showing beneficial effects, and others little or no improvement. The use of the extract has gradually been extended in other directions. It has been used in asthenia, anæmia, cyclic albuminuria, and in diabetes mellitus, in exophthalmic goître, heart disease and capillary hæmorrhages, in hay fever, epistaxis, and nasal catarrh, also in asthma. It has been found of great service in ophthalmic work as it lessens congestion and hastens absorption. It is useful in inflammatory conditions of the conjunctiva, and its use is also indicated in pannus, iritis, keratitis and acute dacryo-cystitis. It controls hæmorrhage in ophthalmic, nasal and obstetric work.

Applied locally it is a powerful astringent and hæmostatic. 1 drop of a 1 in 50,000 aqueous solution of the active principle blanches the normal conjunctiva within 1 minute. Of the dry extract 5 mg. per kilo body weight is sufficient to produce a maximum effect and about $\frac{1}{500}$ of a grain of the active principle is sufficient to produce a distinct effect upon the heart and arteries of an adult man. It has been recommended in Graves' disease, and as an adjunct to the treatment of lupus by the Finsen light. Administration by the mouth has not in some cases been found to be so efficacious as intravenous or subcutaneous injection. For cases of cardiac failure, it is best given intravenously, injections of $\frac{1}{200}$ to $\frac{1}{100}$ grain of Adrenalin being given. Subcutaneous injections of $\frac{1}{1000}$ to $\frac{1}{500}$ grain are recommended in ophthalmic practice to be used immediately before operation.

For introduction into the nose and ear, a 1 in 5000 solution of the active principle is used, or a 5 p.c. solution of the Extract. As an **ointment** 1 of Liquid Extract to 7 of Lanolin Ointment; as a **suppository** containing 2 or 3 minims of Liquid Extract.

5 to 20 minims of solution given every 6 hours in the treatment of neurotic heart.—*B.M.J.* '04, i. 1009.

A case where an unpleasant disturbance of smell, followed within a few hours by a diffuse urticaria extending over the trunk and arms, attended the use of a small swab saturated with Suprarenal Extract applied to the swollen inferior turbinate.—*M.P.* '05, ii. 305. 5 grains, increasing to 10, 15 and 20 grains, administered thrice daily in Addison's disease. An early diagnosis and an early trial of this form of treatment are of great importance.—*L.* '05, ii. 524.

Injections of Adrenal Extract or Epirenan very useful in severe shock and in poisoning bv a general anæsthetic, but caution is needed if heart is weak from long and exhausting illness.—*B.M.J.E.* '05, ii. 52.

Tests.—The powder of desiccated Suprarenal Glands is partially soluble in Water. 0·5 of a gramme macerated with 25 c.c. of Water for a quarter of an hour and filtered yields a filtrate, which gives on the addition of a drop of Ferric Chloride T.S. an emerald-green coloration; the addition of Iodine Solution produces a deep rose-red coloration. It should not yield more than 7 p.c. of ash upon incineration. The active principle of the gland is Adrenalin, discovered by Dr. Jokichi Takamine.

Various preparations of the dried gland, of the extract (solid and liquid), and of the active principle have been introduced for medicinal use. The following include the best known preparations:—

GLANDULÆ SUPRARENALES (sicc. pulv.).—A dry, light brown or drab amorphous powder. Partially soluble in Water. 1 part represents about 5 of the fresh gland.

Dose.—5 grains = 0·32 gramme. Also supplied in tablets containing 0·1 gramme = 1½ grains.

DESICCATED SUPRARENALS (Suprarenal Capsules of the Sheep).—A light, fawn-coloured, or light brownish-yellow powder; 1 grain of the powder representing 8 grains of the fresh Suprarenals.

Dose.—1 to 3 grains = 0·06 to 0·18 gramme.

Official in U.S.

Desiccated Suprarenal Gland Tablets.—Each tablet containing 2 grains of the desiccated gland.

TABLET SUPRARENAL GLAND.—Each tablet represents 5 grains of the gland.

EXTRACTUM GLANDULÆ SUPRARENALÆ HÆMOSTATICUM.—A brown, or dark brown, hygroscopic, amorphous powder, readily soluble in Water. It is a very active preparation of the gland.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme.

EXTRACTUM GLANDULÆ SUPRARENALÆ LIQUIDUM.—A Liquid Extract, 1 part of which is equal to 1 of fresh gland.

Extractum Suprarenalum Liquidum.—Macerate 100 of Trimmed Suprarenal Glands of the Sheep or Ox in 75 of Glycerin for 24 hours, strain and press, and make up the volume to 100 by means of Glycerin and Water in equal parts.—*B.P.C.*

LIQUOR SUPRARENALIS HÆMOSTATICUS.—A pale brownish or pinkish-brown liquid, containing the entire active principle of the gland. It has been used with great success as a **spray** in the treatment of hay fever, coryza, etc.

ADRENALIN. $C_9H_{13}NO_3$, eq. 181·77.—It is the active principle of the suprarenal gland, and in constitution partakes of the nature of an alkaloid. It forms a light, white, or almost white, microcrystalline powder, possessing a slightly bitter taste and leaving a feeling of numbness on the tongue. It is very sparingly soluble in cold Water, but dissolves more readily in hot Water. It dissolves readily in diluted Hydrochloric Acid. It is also soluble in Oleic Acid. The salts are mostly non-crystallisable. Solutions of the active principle readily absorb Oxygen from the air and pass into inactive substances. The active principle in the dry form is perfectly stable, it should, however, be kept in small well-closed glass phials of a dark amber tint in a cool atmosphere and exposed as little as possible. The form in which it crystallises is dependent upon the condition of the solution from which it is crystallised, and it has been known to exist in the form of prisms, fine needles, rhombic plates, boat or leaf-shaped crystals, or in the form of wart-like crystals.

Foreign Pharmacopœias.—Official in Belg. and Fr., not in the others.

Tests.—Adrenalin possesses a weak alkaline reaction towards moistened red Litmus paper, and it also has a faintly alkaline reaction towards Phenolphthalein Solution. The aqueous solution, particularly when alkaline, rapidly absorbs Oxygen from the air and passes from a colourless liquid to a pink, red, and eventually brown one. Its aqueous solution may be boiled without decomposition. The highly dilute aqueous solution has a strong action upon the small blood vessels, 1 drop of a 1 in 10,000 solution when instilled into the eye immediately blanches the conjunctiva. It raises the blood pressure, a dose of even about 0·0000005 gramme being sufficient to produce an effect. The diluted aqueous solution affords with Ferric Chloride T.S. an emerald-green coloration; with Iodine Solution a beautiful rose-pink coloration is produced. On the addition of Potassium or Sodium Hydroxide to the green coloured solution produced by Ferric Chloride T.S., the colour changes from purple to carmine red, and is destroyed when carefully neutralised with diluted acids, reverting to its original colour. Nitric Acid, Potassium Bichromate Solution and Potassium Ferricyanide Solution produce a similar rose-pink coloration to that produced by Iodine Solution. Gold Chloride Solution is immediately reduced by the aqueous solution of Adrenalin, a complete separation of the metal taking place. Although alkaloidal in constitution, it does not possess the chemical properties of an alkaloid, and its solutions are not precipitated by the usual alkaloidal precipitants, *e.g.*, Potassio-mercuric Iodide (Mayer's) Solution, Iodo-Potassium Iodide (Wagner's) Solution, Picric Acid Solution, Tannic Acid Solution, Phospho-Molybdic Acid Solution, and Platinum Chloride Solution. A drop or two of Potassium or Sodium Hydroxide Solution produces a reddish-brown coloration when added to Adrenalin, or even a very dilute Solution of Adrenalin, and simultaneously a distinctive disagreeable odour, resembling Hydrogen Phosphide, is produced. This test has been suggested (*P.J.* '07, i. 718) as a distinguishing test for Adrenalin, the following method being used in carrying it out:—A small quantity of the dry Adrenalin, or a few drops of the 1 in 1000 aqueous solution, is placed in a small porcelain crucible and mixed with 5 to 6 drops of a 10 p.c. Sodium Hydroxide Solution. The solution gradually becomes coloured, and simultaneously a distinctive odour is developed in a few seconds, more or less according to the amount of the Adrenalin present. In the case of a liquid containing substances likely to interfere with the reaction, these must be removed by previous treatment before applying the test. In the case of oily liquids the following method has been suggested (*P.J.* '07, ii. 310). Dissolve from 10 to 20 drops of the oily fluid or an equivalent amount of a solid preparation in about 10 times its volume of Ether and shake in a separatory funnel with 10 to 20 drops of Water acidified with Hydrochloric Acid. When the liquids have separated, the lower aqueous layer is transferred to a small capsule or beaker, heated on the water-bath for a few minutes to remove the Ether and traces of odorous substances, 6 or 8 drops of a 10 p.c. aqueous Sodium Hydroxide Solution are added and the whole covered with a watch-glass and set aside for 4 or 5 minutes. In the event of Adrenalin being present, the liquid will have acquired a distinct and peculiar odour suggesting Hydrogen Phosphide. Several methods have been advocated for the determination of Adrenalin. It has been suggested that both the reaction with Iodine and that with Ferric Chloride might afford a means of colorimetrically determining its amount, but none of the processes have been found to possess any real practical value.

A synthetic Adrenalin (Suprarenin) has been produced and is now a commercial article. The synthesis of substances allied to Adrenalin has been investigated by Jowett and a record of the researches appears in the *J.C.S. Trans.* '05, 967. The chief difference between the synthetic product and the natural appears to be the optical rotation. The natural Adrenalin is lævorotatory, whilst the synthetic Adrenalin, like most synthetic preparations, is optically inactive, and the synthetic preparation is consequently stated not to possess the same physiological activity as the natural product. As the result of experiments recorded (*P.J.* '08, i. 626) it has been shown that in respect to rise of blood pressure both substances are exactly alike, and that the optical activity is probably without any influence. A preparation consisting of three-fourths of the dextrorotatory modification and one-fourth of the lævorotatory is equally as active as the lævorotatory, although the latter has been alleged to be the sole active modification.

Jowett (*J.C.S. Trans.* '04, 192) has established the formula $C_9H_{13}NO_3$ for Adrenalin, and the correctness of this work and formula has been confirmed by Continental authorities working on the same subject.

Medicinal Properties.—It possesses the physiological activity of the medullary portion of the gland, but in a very much enhanced degree. It is the strongest hæmostatic known. It is in the form of dilute solution of this active principle that it is now generally used medicinally. As a daily injection of a 1 in 5000 solution in the treatment of laryngeal papillomata (*B.M.J.* '04, ii. 1224); in the hæmorrhage of typhoid (*B.M.J.* '04, ii. 1452); as a 1 in 1000 spray in aromatised neutral Oil in inflammatory affections of the nose and throat (*L.* '04, ii. 1160); as an injection of 4 to 8 c.c. of a 1 in 1000 solution in tuberculous pleural effusion (*B.M.J.* '04, ii. 1003); in the form of an ointment (1 in 1000) made with a basis of hard and soft Paraffin and Lanolin it has been used for nose and throat application.—*P.J.* '04, ii. 967. Adrenalin solutions have frequently been employed in hæmoptysis, but during the latter part of the year (1904) doubts have been entertained of the expediency of giving the drug either hypodermically or by the mouth in hæmoptysis.—*L.* '04, ii. 1446; *B.M.J.* '04, ii. 1636; '05, i. 68.

The number of cases of surgical shock in which it has been used are few (*L.* '05, i. 849), but there can be no doubt that it affords a very valuable means of treating this condition. When administered intravenously it should be used in very weak solutions. Is rapidly oxidised by the tissues, and its effects are fleeting, so that to be used effectively for raising the blood pressure it is necessary to administer it by continuous intravenous infusion. The strength of the infusion recommended is 1 in 40,000. Serious symptoms have been shown to follow the intravenous injection of 20 minims of a 1 in 1000 solution. If the blood pressure remains low and the patient continues in a dangerous condition of shock, a solution of Adrenalin in physiological salt solution, in the proportion of 1 in 20,000, should be intravenously infused at a rate of about 3 to 5 c.c. per minute.

It has been recommended (*B.M.J.* '05, ii. 125) in the treatment of serous effusions. As much as possible of the fluid is withdrawn by a 2-way trocar and canula, and through the canula still *in situ*, 1 drm. of Adrenalin Chloride (1 in 1000) diluted to ½ oz. with sterile Water, is introduced by means of an exploring syringe. The canula is then removed, the wound closed with Wool and Collodion, and in abdominal cases the abdomen is gently manipulated for 5 minutes and a binder firmly applied.

In the treatment of the hæmorrhage of typhoid (*B.M.J.E.* '05, i. 48), 20 minims of a 1 in 1000 solution are injected hypodermically every 3 hours until the hæmorrhage is arrested. By the mouth 10 minims may be given every hour.

It has been found useful (*B.M.J.* '05, i. 700) in lupus erythematosus owing to its tonic effect on the vascular system.

The dose of Adrenalin has been the subject of much controversy.

Maximal dose of Adrenalin and analogous preparations of the suprarenal capsules has been established by R. Muller (*A.J.P.* '05, 288), who recommends that doses 0·00009 gramme should not be exceeded. This quantity may be increased to 0·00015 gramme in cases where the patient is under the influence of an anæsthetic.

The new Belgian Pharmacopœia includes Adrenalin and gives tests by which it can be identified. According to the text the 1 in 1000 solution intravenously injected is fatal to a rabbit in a quantity equivalent to less than 0·001 gramme of the active principle per kilogramme of the animal; a dose of even about 0·0000005 gramme raises the blood pressure. This is the first official recognition of the principle of physiological standardisation.

Uses in ophthalmic surgery.—*Jour. of the Roy. Army Med. Corps* '08, i. 58.

Externally in form of ointment (1 of Chloride to 1000 of base) in neuralgia, neuritis and referred pain, applied along course of nerve involved.—*T.G.* '07, i. 293.

Good results in diabetes insipidus.—*B.M.J.E.* '07, ii. 12.

Prescribing Notes.—*When ordered in aqueous or other solution it is usually dissolved in just sufficient diluted Hydrochloric Acid to effect solution. A convenient basis for an oily preparation for a spray is a mixture of* 1 *part by weight of Absolute Alcohol, to* 4 *parts by weight of Castor Oil, previously dissolving the Adrenalin as above directed. The strength of the Adrenalin may vary from* 1 *in* 1000 *to* 1 *in* 4000, *according to the wishes of the prescriber; Oil of Gaultheria and Eucalyptol can be added as antiseptics.*

ADRENALIN CHLORIDE SOLUTION.—A transparent, almost colourless liquid, containing 1 part of Adrenalin Chloride, and 5 parts Chloretone in 1000 parts of Normal Saline Solution.

It should be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere and exposed as little as possible to contact with the air and light. In neutral or faintly alkaline solution Adrenalin is liable to rapidly change in colour, but if the solution be made faintly acid in reaction, the change in colour does not take place with anything like the same rapidity.

For nasal, aural and ophthalmic use it may be diluted to form a 1 in 2000, a 1 in 5000, or a 1 in 10,000 solution.

Dose.—5 to 30 minims = 0·3 to 1·8 c.c. for internal administration.

Liquor Adreninæ Hydrochloricus.—Adrenine, 0·10; Chloroform, 0·50; Sodium Chloride, 0·90; Diluted Hydrochloric Acid, 0·25; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

INSUFFLATIO ADRENALINI COMPOSITA (Squire).—Adrenalin, 1 grain; Boric Acid, in fine powder, 1 oz.; Camphor, in fine powder, 1 oz.; Cocaine Hydrochloride, 1 grain; Menthol, 40 grains; Eucalyptus Oil, 10 minims; Lycopodium, 2 oz.

COMPOUND SUPRARENALIN SNUFF.—Boric Acid, 240 grains; Camphor, 20 grains; Cocaine Hydrochloride, 1 grain; Suprarenalin Powder, 1 grain; Lycopodium, 2 oz.; Menthol, 60 grains; Potassium Chlorate (in powder), 120 grains; Oil of Eucalyptus, 10 minims.—*Armour's Formulary.*

PULVIS SUPRARENALIS COMPOSITUS. *Syn.* Suprarenal Snuff.—Dry Suprarenal, 5; Boric Acid, in powder, 30; Camphor, 1·50; Menthol, in powder, 3; Oil of Eucalyptus, 1; Lycopodium, *q.s.* to produce 100.—*B.P.C.*

NEBULA ADRENALINI (Squire).—Adrenalin, 0·1; Sodium Chloride, 0·9; Chloretone, 0·25; Water, to 100.

Nebula Adreninæ.—Hydrochloric Solution of Adrenine, 20; Chloroform Water (1 in 200), sufficient to produce 100.—*B.P.C.*

NEBULA SUPRARENALIN ET COCAINÆ.—Suprarenalin or Adrenalin Solution (1 in 1000), 90 minims; Cocaine Hydrochloride, 9 grains; Distilled Water, 1 fl. oz.—*Bournemouth Formulary.*

Nebula Adreninæ cum Cocaina.—Hydrochloric Solution of Adrenine, 20; Cocaine Hydrochloride, 2; Chloroform Water (1 in 200), *q.s.* to produce 100. —*B.P.C.*

SOLUTIO SUPRARENINI BORICI.—Suprarenin, 0·1; Boric Acid, 0·25; Sodium Chloride, 0·9; Thymol, 0·06; Water, to produce 100.

A Suprarenin Borate prepared from synthetic **Suprarenin** may be employed in the preparation of the above solution.

Liquor Adreninæ Boricus, Boric Solution of Adrenalin.—Adrenine, 0·1; Boric Acid, 0·2; Chloroform, 0·5; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

SUPPOSITORIA ADRENALINI (Squire).—Adrenalin, ½ grain; Water, 16 grains; Boric Acid, 1 grain; Anhydrous Lanolin, 24 grains; Oil of Theobroma, *q.s.* to make 480 grains; divide into 32 suppositories.

SUPPOSITORIA ADRENALINI ET ÆSCULIN (Squire).—Adrenalin, ½ grain; Æsculin, 32 grains; Boric Acid, 1 grain; Water, 16 grains; Anhydrous Lanolin, 24 grains; Oil of Theobroma, *q.s.* to make 480 grains; divide into 32 suppositories,

SUPPOSITORIA SUPRARENALIN.—Suprarenalin, ½ grain; Boric Acid, 1 grain; Distilled Water, 15 minims; Anhydrous Lanolin, 50 grains; Cocoa Butter, 400 grains. Dissolve the Suprarenalin and Boric Acid in the Water. Mix with the Lanolin. Add the melted Cocoa Butter, pour into 15-grain moulds when cooling. Each suppository contains Suprarenalin $\frac{1}{60}$ grain equal to 16 minims of the 1 in 1000 solution.—*Bournemouth Formulary.*

Suppositoria Adreninæ, Adrenine Suppositories.—Adrenine, 0·1; Boric Acid, 0·2; Distilled Water, 3; Wool Fat, 10; Oil of Theobroma, 100.—*B.P.C.*

UNGUENTUM ADRENALINI (Squire).—Adrenalin, 0·1; Diluted Hydrochloric Acid, 0·2; Water, 2; Soft Paraffin, 33; Hydrous Wool Fat, sufficient to produce 100.

Unguentum Adreninæ, Adrenine Ointment.—Adrenine, 0·1; Boric Acid, 0·2; Water, 3; Hydrous Wool Fat, 50; Soft Paraffin, to produce 100.—*B.P.C.*

An **Unguentum Adreninæ Mitis,** *B.P.C.*, is prepared by diluting 1 of the above Ointment to 5 with Soft Paraffin and perfuming with Otto of Rose (1 to 1000).

Unguentum Adreninæ Album, White Adrenine Ointment.—Adrenine, 0·1; Hydrochloric Acid. *q.s.*; Castor Oil, 5; Absolute Alcohol, 2; White Soft Paraffin, to produce 100.—*B.P.C.*

UNGUENTUM SUPRARENALIN ET COCAINÆ.—Suprarenalin, ½ grain; Boric Acid, 1 grain; Cocaine Hydrochloride, 5 grains; Distilled Water, 15 minims; Hydrous Lanolin, 250 grains; Vaseline, 250 grains. Dissolve the first 3 ingredients in the Water and mix with the Lanolin and Vaseline. Contains Suprarenalin, 1 in 1000, Cocaine Hydrochloride, 1 in 100.—*Bournemouth Formulary.*

This has been incorporated in the *B.P.C.*

EPINEPHRIN.—A white, or greyish-white powder, which is regarded by Abel and Crawford as the active principle of the suprarenal gland.

Its chemical constitution has been recently investigated by Dr. Jowett.—*B.M.J.E.* '99, i. 35; *P.J.* '03, i. 1; '04, i. 247.

SUPRARENALIN.—A light yellow, stable non-hygroscopic crystalline powder. Slightly soluble in cold Water and in Alcohol. It is stated to possess all the therapeutic properties of the Suprarenal Capsules.

Suprarenalin Solution.—A slightly alkaline stable solution, containing 1 of Suprarenalin in 1000.

RENAGLANDIN.—A light brown syrupy liquid. It is stated to be a concentrated and aseptic fluid extract of suprarenal gland. Each fl. drm. is equivalent to 5 grains of the fresh gland.

RENALINE.—A greyish-white crystalline powder, only slightly soluble in cold Water, more readily soluble in warm Water. It gradually darkens in colour when exposed to the air and light. It forms definite salts with the Acids; the chief salt being Hydrochloride. It is also sold in the form of a 1 in 1000 solution and in glass capsules containing 1, 2 and 5 c.c. of a sterilised solution (1 in 1000, 1 in 2000, or 1 in 10,000).

NEBULA EXTRACTI SUPRARENALIS.—Suprarenal Extract, 48 grains; Sodium Sulphate, 10 grains; Boiling Distilled Water, to 1 fl. oz. = 10 p.c. solution.—*Central Throat.*

SUPRARENAL OINTMENT.—Liquid Extract of Suprarenal Gland, 50 minims; Liquid Paraffin, 2 drm.; Hydrous Wool Fat, to 1 oz. It may be scented with Otto of Rose.—*Martindale.*

Unguentum Suprarenalis.—Liquid Extract of Suprarenals, 10; Liquid Paraffin, 25; Hydrous Wool Fat, *q.s.* to produce 100. This ointment is sometimes perfumed with Otto of Rose.—*B.P.C.*

Not Official.

SYRUPI.

Syrups are apt to ferment or become mouldy when made with too little Sugar, and to crystallise when too concentrated, or when mixed with Acids or Alcohol. There is no uniformity in the method given in *B.P.* for the 22 Syrups which are official. In 7 of them the final product is directed to be made to a given volume by the addition of Water or of Syrup, and in 3 of them to a given weight. The sp. gr. is mentioned in 2 of them, Syrupus, and Syrupus Ferri Iodidi. In the case of Syrupus Sennæ and Syrupus Tolutanus, the fluid is made up to a given volume by the addition of Distilled Water before the Sugar is dissolved in it, but in Syrupus Hemidesmi and Syrupus Rosæ no such precaution is taken. Syrupus Aurantii and Syrupus Zingiberis are both mixtures of a Tincture with Syrup, but the latter is made up to a definite volume, the former is not.

Not Official.

TABACI FOLIA.

LEAF TOBACCO.

The dried Leaves of the Virginian Tobacco, *Nicotiana Tabacum*, L.

Official in *B.P.* '85, but now omitted.

When dry they yield about 20 p.c. of ash, containing a large proportion of Potassium Carbonate.

The Virginian leaf contains about 6 p.c. of **Nicotine,** and is one of the strongest varieties of Tobacco.

Medicinal Properties.—A powerful depressant, especially affecting the heart and respiration. Smoked, it is sedative and antispasmodic in various cases of asthma. Occasionally used as snuff for its errhine action, increasing the flow of nasal mucus.

It forms the basis of a proprietary article for the relief of neuralgia of the face.

Nicotine is one of the most powerful and rapid poisons known.

Smoke from both tobacco and hay found to be bactericidal to pathogenic bacteria.—*L.* '07, i. 1220.

Tobacco-juice (a strong infusion) is a powerful insecticide, but some preparations for this purpose contain Arsenic in addition to the Tobacco, and in a case that came under our notice, several animals were killed by the Arsenic.

Antidotes.—In case Tobacco has been swallowed, an emetic; stimulant, internal and external. Recumbent position; Tannic Acid; Nux Vomica or Strychnine.